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Developments in Meter Making

H. E. MILLER
Consulting Manufacturing Engineer
Westinghouse Electric & Mfg. Company

Stroboscopic testing and the consolidation of manufacturing operations have put a production job in line with today's demand

BUSINESS has reached a point where it no longer suffices to put manufacturing facilities in a standby condition pending the return of 1929 activity. During the boom years, plants were organized and reorganized to meet ever mounting demands upon their output. High pressure production was the watchword. In many instances this stimulus resulted in a manufacturing set-up entirely unsuited to present-day requirements.

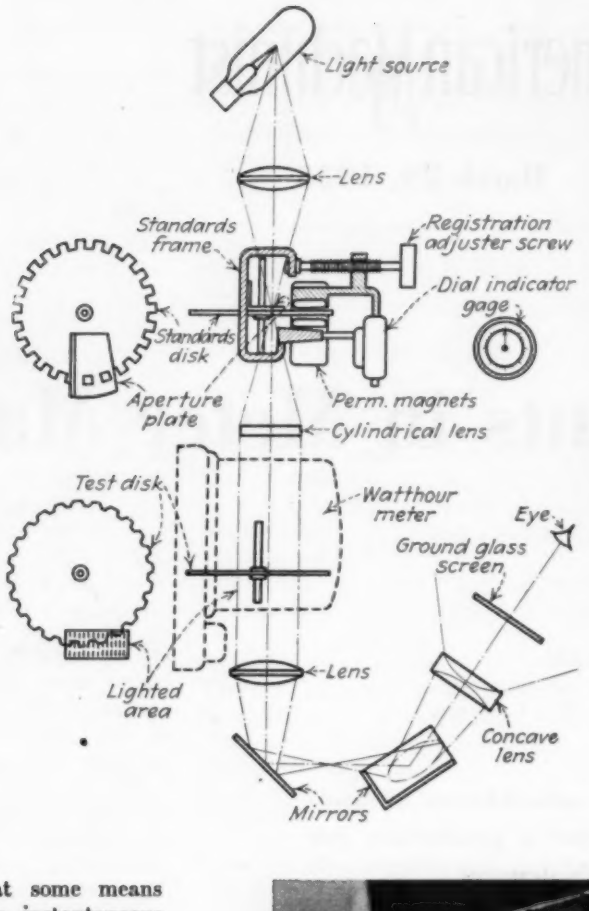
Instead of marking time and waiting for a return of the days of capacity output, many managers are adapting facilities at their command to meet current needs. They are seeking ways to put present output on a profitable basis. This often means manufacturing in a different way—a more scientific way. It means the application of new developments to the shop.

Making the watthour meter, the instrument familiar to users of electric current, is an example of a transition in manufacturing methods which has resulted from an analytical approach. At the peak of production the Newark plant of the Westinghouse Electric and Manufacturing Company made a large number of these meters daily. Curtailment of building and diminished activity in the wiring of old homes naturally had a considerable effect upon the demand for this product. This reduction has put an entirely new aspect on problems of production.

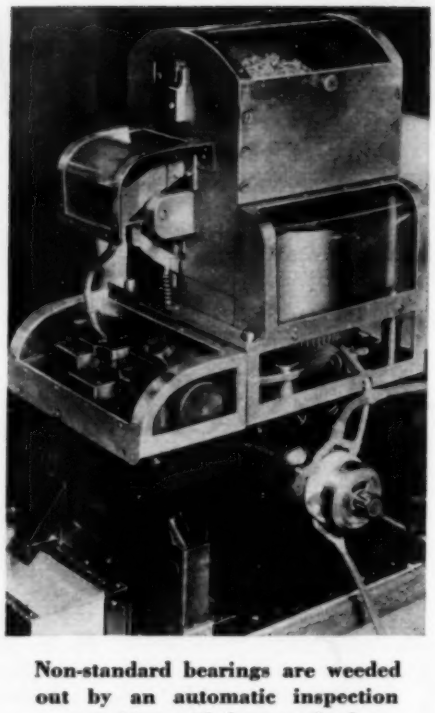
Under the previous plan of manufacture, a number of floors were used to assemble the Westinghouse "OB" Meters. These contained respectively the machining, winding, assembling and testing departments. Now everything except draw press, screw machine and plating operations is concentrated on one floor, with resultant economies in supervision and material handling.

The transformation began with the last step—testing. Under the old set-up, calibration of the meters was a painstaking and time-consuming job. The method used consisted of checking each meter against a master by connecting the two in series. A black spot sprayed on each meter disk enabled the operator to synchronize the test meter with a precision master standard. Adjustments were necessary at light, full and inductive load. After each adjustment several seconds were consumed in determining whether or not the meters were synchronized.

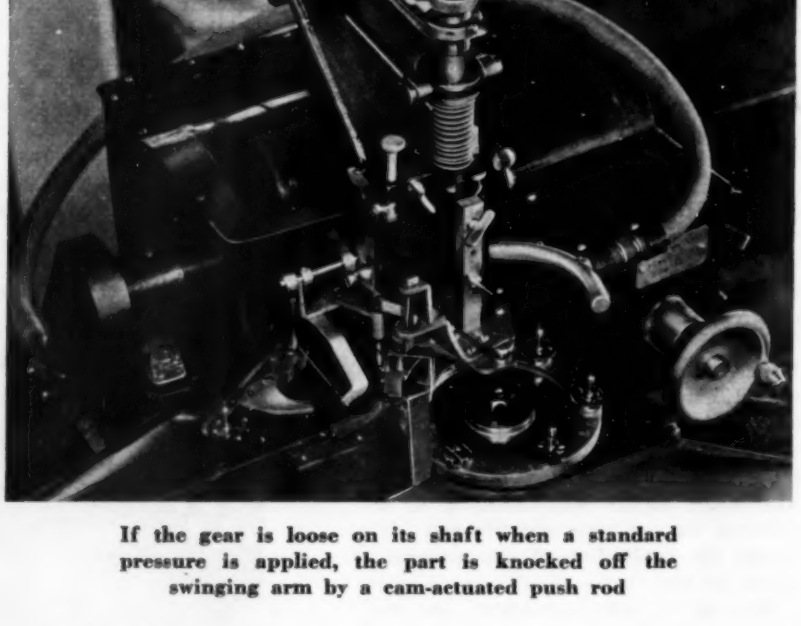
Speed and precision result from the application of the stroboscopic principle to watthour meter calibration



A diagrammatic view shows how the production meter is compared to the standard



Non-standard bearings are weeded out by an automatic inspection machine with hopper feed



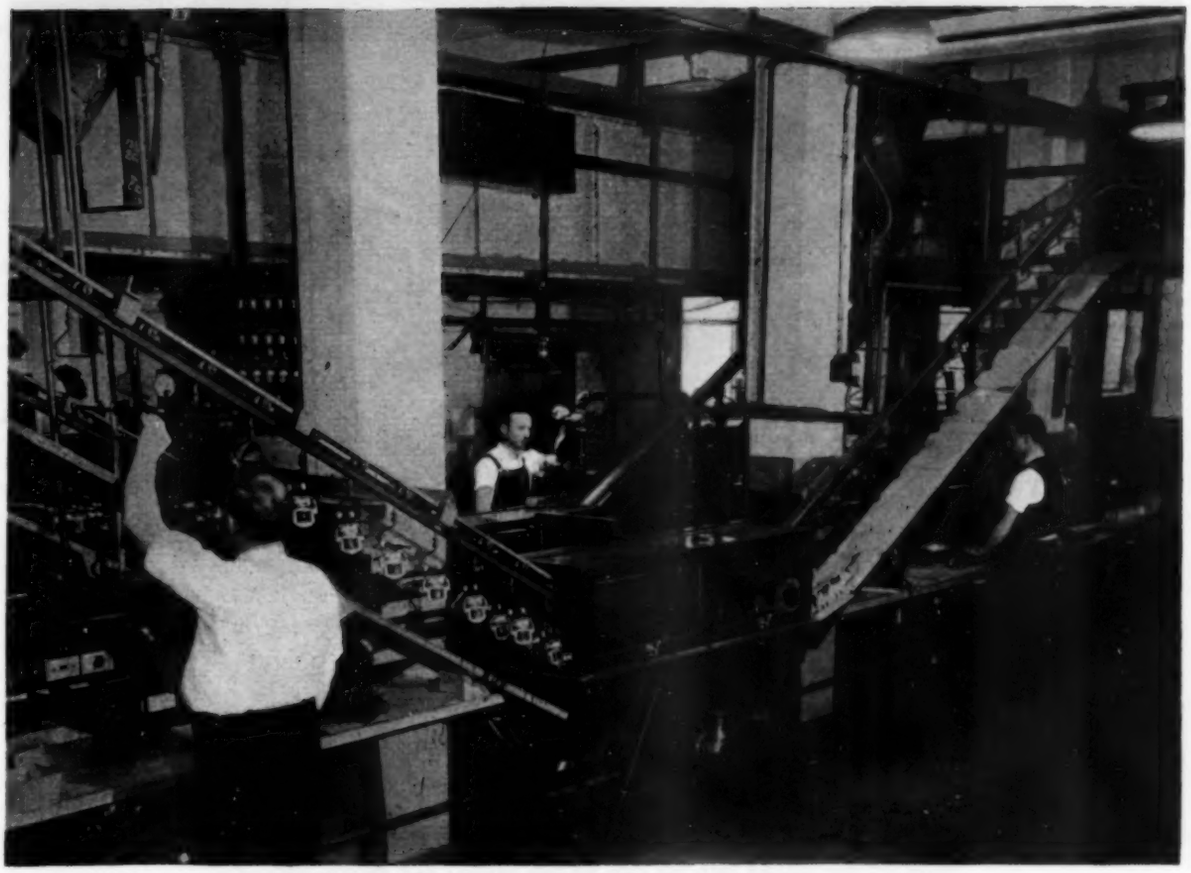
If the gear is loose on its shaft when a standard pressure is applied, the part is knocked off the swinging arm by a cam-actuated push rod

It was apparent that some means was needed whereby an instantaneous check could be made between the meter in production and the master. The first solution entailed the use of a photocell or electric eye. A light focused on the photocell was interrupted by slotted teeth in the periphery of the disk in the master. The output of the photocell in turn operated an amplifier which controlled a Neon light. Thus a flickering illumination was produced with a frequency identical to that of the disk speed of the master.

When viewed under this light, the disk on the meter being tested appears to be stationary when perfectly synchronized with the light. If moving faster or slower, it appears to turn slowly in one direction or the other. By use of this method, the effect or adjustment may be instantly determined. In addition the chance of observational errors because of the human element is greatly reduced producing more accurate test results. Incidentally the same principle was employed at this year's automobile show to make the pistons of a motor running at 1,200 r.p.m. appear to move slowly.

The success of the stroboscopic principle to meter calibration led to a further development. The photocell and amplifier were eliminated by mounting the master directly above the meter under test. The source of light is fixed so it will pass between the teeth of the disks on both meters through a lens to a pair of mirrors from which it is reflected on a ground glass screen. The stroboscopic effect is the same as when the photocell is used, the teeth on the screen appearing stationary when both meters are in step. This set-up, shown diagrammatically, is more direct and makes meter adjustment and calibration possible within a few seconds. The Neon light method is used in portable instruments for testing service meters on customers' premises.

For factory production, this operation is performed in two steps, a preliminary adjustment and a final check. One group of girls adjusts and compares each production meter with a working master set to the correct speed. Further along the conveyor a group of inspectors check each meter in a similar manner on stro-



Inclined conveyors and overhead drying ovens facilitate the treatment of electromagnet coils in a minimum of floor space

boscopic stations equipped with instruments which read the accuracy in percentage.

The revised testing system proved to be only a start that led to a complete revamping of the entire manufacturing layout. Every step in meter production was critically analyzed until at length the whole process was revised and consolidated.

The present set-up consists of three conveyor lines, one for electromagnet assembly, one for base, terminal and frame assembly, and one for final assembly. Parts requiring heavy press work enter the department already formed, but smaller press operations and machine work are performed on the same floor. Watch lathe work is done on feeder lines adjacent to the assembly line. Other machine operations that are needed during assembly are put into their proper sequence in the line.

One interesting development is that of automatic machine inspection. For instance, it is highly important that the jeweled seat for the main shaft bearing be kept within a small tolerance to the bottom of the recess at the other end of the same part into which the shaft itself fits. The parts are fed into a machine that, by means of a dial indicator, in conjunction with electrical contacts, automatically sorts them into three groups: one oversize, one undersize and one standard. Another machine tests the tightness of the main shaft pinion and gear wheel fit by applying a predetermined amount of pressure. If the pinion moves under this pressure, the pieces are automatically rejected.

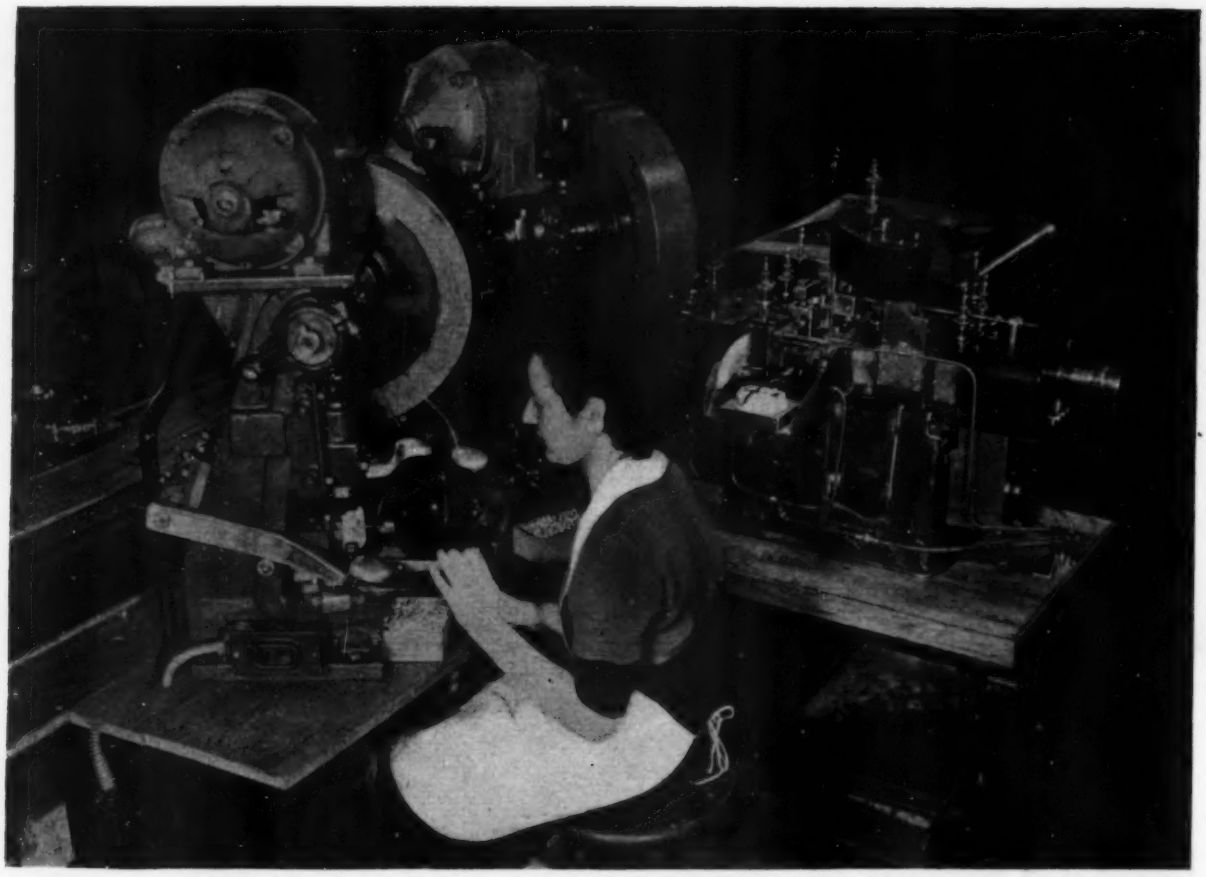
Many other automatic and semi-automatic machines have been developed and are in use, while others are in the process of development.

Parts for the assembly are carried along on conveyors, but unlike automotive practice, these conveyors do not move continuously. Each operating station is provided with a push button which actuates an electric relay. When an operator completes her work on each part, she returns it to the conveyor and pushes the button. As each button is pushed, a red light shows at that station. When all work is completed and all the buttons are pushed the conveyor indexes one station, stops automatically and all signal lights are extinguished. When a particular station is not in use, the corresponding relay is disconnected so the conveyor may be operated from the remaining stations.

Probably the most interesting step in the electromagnet assembly is the method of treating. Before being assembled the coils are impregnated under pressure in a special compound. After the laminations are assembled, the series and compensating coils are wound and the terminals fitted. These units are then placed on a special conveyor which gives them a double dip in insulating enamel but holds the terminals clear of the bath. The conveyor travels upward along an incline to the drying ovens overhead. Its speed is so regulated that the two dips and drying processes are completed by the time the parts return to the starting position. This arrangement saves floor space and handling time.

The base assembly lines start with a special multiple-spindle drilling, tapping and reaming machine which performs fourteen operations in one set-up. The terminal blocks are then assembled and fitted to the frame and case in a hand-operated press. The electromagnet is added using a portable socket wrench for running up the nuts. The terminals are connected to the block, and the meter case is closed after the gasket has been fitted..

The most delicate part of the assembly lies in the gear train and indi-



Bushings are pushed into the case by two presses and then machined automatically in the machine at the right

cating mechanism. This includes a larger number of detailed operations having to do with the mounting of the gears, the assembly of the aluminum disk and shaft and repeated inspections for free operation and trueness.

The thrust of the vertical shaft carrying the disk is taken on a hardened steel ball between a jewel in the shaft and a second jewel in the lower bearing. Steel balls are kept in a container resembling a hypodermic needle. The operator by a push of the thumb is thus enabled to place the ball on the lower jewel during the assembly operation.

Pointers are placed on the four pointer shafts simultaneously by a special press. The pointers are strung on wires and are mounted in vertical guides from which they are fed automatically. One stroke suffices for a step that formerly required four separate operations.

The mounting of the name plate and permanent magnet completes the assembly. The meter is then ready for the stroboscopic test already described after which the glass cover and terminal cover are mounted.

A percentage of meters are given a temperature test during which they are operated within a special cabinet provided with refrigerating and heating units. The temperature is reduced to —10 deg. C. and held there from two to three hours. Then it is raised in successive steps to 50 deg. C., test readings being taken for intermediate points. A fan circulates air through the cabinet during these tests.

Four pointers are mounted simultaneously in a magazine-fed press, and their readings are checked against a standard gear train

In addition to a simplification of the manufacturing operations the design of the product itself has been modified to effect greater standardization. Only three current ratings are required for self-contained loads which enables central stations to carry fewer meters in stock. Most of the parts for the three ranges of meters are interchangeable which reduces the number of repair parts required.

• NEW BOOKS •

FORGING—*By J. L. Beacon, revised by Carl G. Johnson. One hundred and ten pages 5¼x5¼ in. Published by the American Technical Society, Chicago. Price $1.25.*

This is a revision which brings a well known text book in line with the changes that have been made in steels and heat treatments since the original edition. It is well illustrated to make the student familiar with the different implements used by the blacksmith, and to some extent, with the drop hammer and similar machines. The second section of the book deals with the metallurgical effect of forging. Here again the illustrations are simple and numerous and should aid greatly in securing an elementary knowledge of the subject.

INVESTIGATIONS ON THE WORK OF TWIST DRILLS—*By Prof. A. Wallichs, H. Beutel, and W. Mendelson. 32 pages, 8¼x11¾. Illustrated. Paper bound. Published in German by VDI-Verlag, Berlin, Germany. Price RM 5.20.*

Unfortunately, specific data on machinability are not available in the detail necessary for each shop to set its standards with a certainty of securing the best results. This booklet setting forth German experiments on drilling in part fills this gap. It consists of three treatises: the first devoted to the cutting forces and life of twist drills; the second, to the drilling properties of various kinds of cast iron; and the third, to equations for the cutting forces and usable cutting speeds.

TIME AND MOTION STUDY. *Second Edition. By Stewart M. Lowry, industrial engineer, The Proctor and Gamble Companies, Harold B. Mayard, management engineer and G. J. Stegemorten, superintendent, time-study department, Westinghouse Electric and Manufacturing Company. 471 pages, 5⅞ x 9 in. Clothboard covers. Indexed and illustrated. Published by the McGraw-Hill Book Company, 330 West 42nd St., New York, N. Y. Price $5.00.*

While following the general plan of the first edition, this volume further emphasizes the application of formulas to time study. The authors seek to correct the impression, which they feared the first edition conveyed, that formulas have a limited field of usefulness. Accordingly examples are given of this method for widely diversified kinds of work such as panel mounting, molding, storeroom activities, print shop jobs and typing.

Another addition is an increased stress on the uses of motion study as an essential part of time study. The Gilbreth technique is set forth in some detail.

PATTERN MAKING. *By Ritchey, Monroe, Beese and Hall. Two hundred and twenty-three pages 5¼x8¼ in. Published by the American Technical Society, Chicago. Price $1.75.*

A text book by instructors for students in the interesting and important trade of pattern making. The original book by Ritchey has been revised in turn by the three others, who have added illustrations and descriptions of the newer developments in pattern and foundry equipment. The relation between pattern making and foundry work is clearly shown, with illustrations of molding machine equipment, methods of molding and other phases of the work. It should give the student an understanding of the elements that underlie both pattern making and molding.

ELASTIC WORKING OF METALS AND POWER PRESS OPERATIONS. *By E. V. Crane, M.E. 326 pages, 6x9 inches. Published by John Wiley & Sons, Inc., New York. Price $4.00.*

Beginning with the metallurgy that is essential in punching and forming metals there are sections on shearing, bending, expanding, contracting and curling, cold working of plastic metals, drawing operations which includes data on speed, lubrication and annealing, cold operations by squeezing, extrusion and hot press forging. Charts and tables for easy computations of shearing, drawing, ironing, coining and forging as well as data on speeds, fly wheel capacity and other factors are also included. The book is fully illustrated and contains much valuable information for anyone whose work involves the press working of metals.

REWINDING SMALL MOTORS. *By Daniel H. Braymer and A. C. Roe. 63 pages, 6x9 in. Published by McGraw-Hill Book Co., New York. Price $2.50.*

This is the second edition of a book that has been found very useful to repair or maintenance men in many plants. It covers the practical details of repair shop practice in a progressive manner and shows clearly how to rewind all types and designs of small motors for both a.c. and d.c. current. Although the book confines itself to motors of fractional horsepower the information will be found of value in larger motor work. Both line and halftone illustrations are used profusely to show the tools used and how the work is handled in various stages. The new edition contains an appendix devoted to special a.c. motors. Here, as is the body of the book, numerous diagrams make clear the circuits and the windings used.

THE NEW NECESSITY—*Charles F. Kettering and Allen Orth. 124 pages. 5x7½ in. Bound in clothboard. Published by The Williams & Wilkins Co., Baltimore, Md. Price $1.00.*

Since the title gives no clue to the content of this finely bound little book, it is necessary to say that it "covers" the highlights in the evolution of the motor car. Since Mr. Kettering is who he is (at the head of General Motors Research), he stresses the part that research has played in automotive development and refinement. The non-automotive engineer and designer will find suggestions in this non-technical exposition which he may wish to adopt in his own line of work. Chapter VII, "The Corrosion Mystery," and Chapter IX, "Standardization," will be found well worth the reading.

Turning Single-Throw Crankshafts—*Discussion*

HARRY SHAW
Consulting Engineer, Heywood, Lancashire, England.

The method of locating and turning crankshafts described by P. Oppuysen in an article under the title given above (*AM*—Vol. 76, page 795) does not lend itself to the taking of heavy cuts, for the leverage produced by the throw of the crank is so great that the tendency of the pressure of the cut to turn the shaft is tremendous, and it is doubtful if the two clamping screws are sufficient to prevent it, even under moderate cuts. If the crank does turn under pressure of the cut, there will, of course, be a real smash up.

A plate having a hole for the straight part of the shaft to pass through should be attached to the end of the pipe in which the crankshaft is held. Two screws should be threaded through lugs in this plate, so that they can be tightened on each side of the crank web to take the pressure of the cut and prevent the shaft from turning.

Aging of Springs

ROBERT W. CARSON

Aging effects are more active in metals that are quenched or cold worked in producing their useful qualities

IN RECENT years the study of the elastic properties of metals at elevated temperatures has emphasized their unstable qualities, and has also indicated that these unstable effects would exist at lower temperatures although to a smaller degree.

Aging in metals is a change observed in such properties as strength, hardness, ductility, elastic modulus, physical dimensions, structure and magnetic properties, which takes place when the metals are quiescent at or near normal temperatures. This aging effect is readily recognized in the normal hardening of duraluminum, the partial loss of magnetism in permanent magnets, the self annealing of cold-worked lead, and the growth of cast iron. In most instances, however, aging proceeds at such an extremely slow rate that sensitive and careful measurements are required to establish its nature. It has been reported that with a sufficient length of time springs may increase in strength as much as 5 per cent, coiled springs may unwind 10 per cent, bends in cold formed springs may be relieved an appreciable amount, quenched springs may change in hardness and ductility as much as 50 per cent, and elastic modulus up to 10 per cent. It is very important that these unstable characteristics be recognized, for in many engineering applications the useful life of the metal part is long enough that aging may introduce serious effects.

Several studies of aging have been reported recently. The National Advisory Committee for Aeronautics has investigated the effect of aging on the performance of altimeter diaphragms. The Army Ordnance Department has studied the effect of aging on the strength of cannon. Certain manufacturers of sensitive measuring devices have reported investigations on the aging of control springs. Some data has recently been reported on the aging of steel sheets, castings, and cold rolled products. A bibliography including these references is found at the end of the article.

A study of the reported data reveals two important facts, that aging is greater in cold worked or quenched materials, and that the rate of aging increases rapidly with only a very moderate increase in temperature. In an investigation of the aging of cold worked phosphor bronze instrument springs it is stated that aging is due to trapped stresses set up in the forming operation. In an unreported investigation the author has found that in cold worked phosphor bronze an increase in the cold working causes an increase in the aging rate of this material at room temperature. Quenching of some alloys produces a tendency to age that is very similar to the aging effect produced by cold working. A very good example is found in some of the recently developed air hardening copper alloys. When cold working or quenching of a material introduces a room temperature condition that is unstable the tendency to age will be present.

Temperature Affects Aging

There is general agreement in all reported data that moderate increases in temperature cause a large increase in the aging tendency. Illustrations of the effect of temperature on the rate of aging are shown in Fig. 1 in which the time required for complete aging at various temperatures is compared to the time required at room temperature. The increase in elastic modulus of cold worked phosphor bronze reported by MacGahan and Carson, the increase in the hardness of strip steel as given by Whittemore, the increase in hardness of low carbon steel as shown by Bates, and the hardening of a quenched steel casting given by Briggs are all affected in a very similar manner by moderate changes in temperature. In the curve for the phosphor bronze material it will be noted that the rate of aging at 100 C. is nearly 100,000 times the room temperature rate.

There is also general agreement among investigators that any aging which occurs is permanent, and that aging proceeds at a constantly diminishing rate, as shown in Fig. 2 for cold worked phosphor bronze springs tested by the author. These conclusions agree with the conception that aging is evidence of an unstable physical or chemical condition. Increasing the temperature of the metal may allow certain more unstable zones

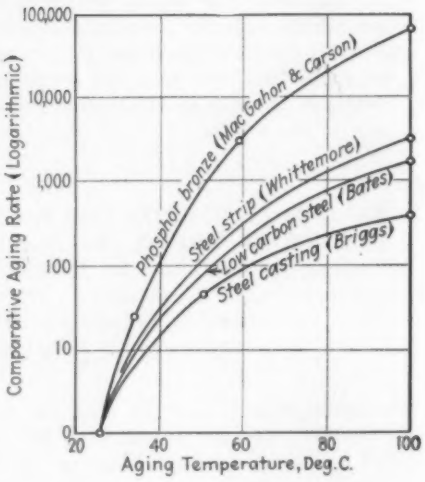


Fig. 1—Effect of aging temperature on rate of aging. Comparison of time required for complete aging at various temperatures to the time required at room temperatures

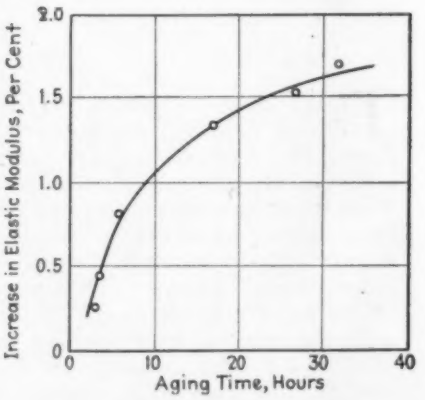


Fig. 2—Increase in elastic modulus for a 4 per cent Sn-phosphor bronze spiral spring aged at 100 deg. C. — cold-drawn wire, cold rolled and formed at 300 deg. C. for 15 min.

to overcome very slowly the decreased viscosity of the warmed metal so that in these zones the unstable condition is slowly brought to equilibrium. At still higher temperatures the further decrease in the viscosity of the metal may permit readjustment of additional unstable zones at a more rapid rate. As the unstable zone approaches an equilibrium condition its aging tendency decreases so that aging proceeds at a constantly diminishing rate.

Several investigators have brought out that holding a material for a sufficient length of time at a somewhat higher temperature than the maximum service temperature will prevent further aging at any lower temperature. A disadvantage of this procedure in the case of most materials lies in the extremely long time required to reduce the aging rate to a satisfactory amount. However, as shown in Fig. 1, the aging tendency can be dissipated in a much shorter time if the aging temperature is raised. The temperature must not exceed the lowest recrystallization or transformation point, and the aging time should be long enough to reduce the aging rate at the heat treating temperature to less than 10 per cent of the initial rate. The aging heat treatment given in Table I will relieve any aging tendency at room temperatures for springs made from the materials listed.

Table I. Recommended Aging Heat-Treatment for Springs

Spring Material	Heat-Treatment
Phosphor Bronze	100 C. for 15 hr.
Hard Drawn Brass	120 C. for 10 hr.
Hard Drawn Nickel, Nickel Silver, Monel Metal	150 C. for 8 hr.
Low Carbon Steel, Low Alloy Steel	200 C. for 5 hr.
High Carbon Steel, Nickel Steel, Stainless Steel	300 C. for 5 hr.

Trapped Stresses

In the design of members used as springs a cold worked or quenched material is often used because of the higher strength and elastic modulus obtained from such materials. Frequently such springs are bent cold to a desired shape, and trapped stresses are thereby introduced. Very often a spring is used in an application where it must maintain a fixed free position, or where it must store a specified amount of energy for a given deflection. In many applications the spring may be subjected to a moderate increase in the working temperature. Any one or a combination of these conditions is conducive to aging and may result in uncoiling, an increase in strength and elastic modulus, or a change in the free position of the spring. Under such conditions it is recommended that springs be given the aging heat treatment outlined in Table I after all manufacturing operations on the springs are completed.

For those wishing to make a first hand study of the investigations relating to the subject the following references are recommended.

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Paying for Advice

JOHN R. GODFREY

Young Tom Johnson seems not only to have absorbed a lot of his dad's ideas but to have gone him one better in some things. Here's a case I ran into the other day.

Tom has a new motor coming along and he naturally wants to know the best way to make the parts. Should he hob the gears or shape them? Should he grind the teeth or lap them? Should this piece be milled or broached? So Tom wrote to a few of the best concerns something in this fashion:

"We inclose blueprints of a piece we want to build, probably in 1,000 lots. The material is S.A.E. No. 3145 steel. We want your advice as to making it either on our present equipment or on new machines.

"Kindly let us know your charge for such advice, as it will not be accepted without remuneration. We are asking several other concerns for similar advice, all of which will be paid for. We will then be in position to select the method we feel to be best suited to our needs, without the slightest obligations to buy any machine unless it seems desirable. We want your best advice as your engineer would give it to a client if he were a consultant and getting an adequate fee.

"Please do not send a salesman or sales engineer until we ask for one, as it will involve unnecessary expense on your part."

Old Man Johnson showed me the letter. And there was a satisfied look on his face.

"How's that for doing things in a new way, Godfrey? And it worked well, too. We got a lot of good ideas and in the end we had one company build us an attachment for a machine we already had. Paying for our consulting service left us free to get the attachment made where we thought was best. This having strings on a job because someone gives you a bit of good advice often leads you into trouble. You buy a machine you don't really want because the engineer showed you a method that was good.

"I believe it's better for the machine builders, too. In most cases six or eight of them give a lot of free engineering service while only one gets the order. Of course the cost of this has to be tacked on to machines they sell, and we all pay for the service some other fellow got. I'm a great believer in direct taxation, so you know just what you pay for and can decide for yourself whether the service is worth it or not. The same thing applies to free service on machines —but that's another story."

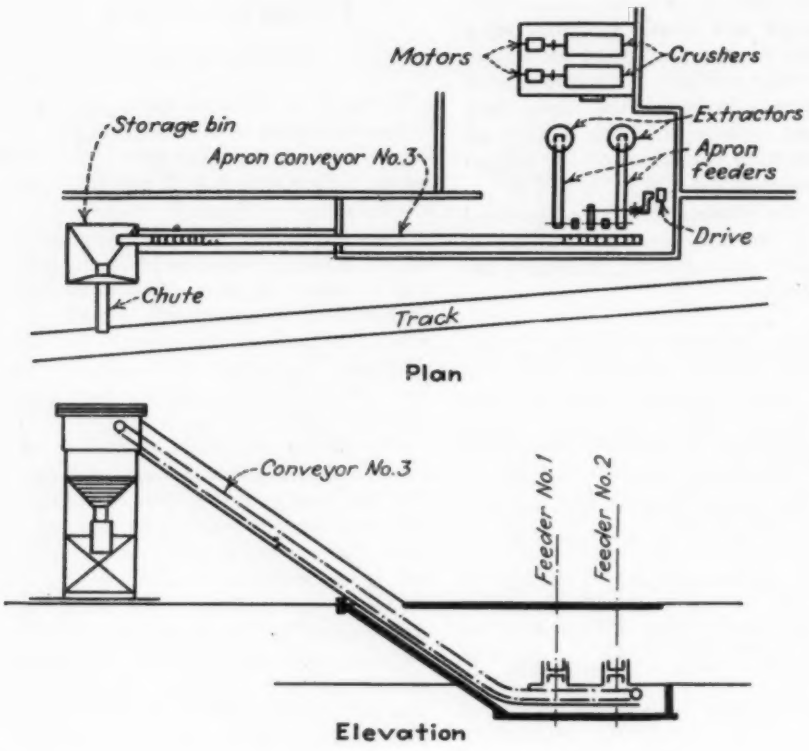

Fig. 1 — Diagrammatic arrangement of crushing and conveying equipment for steel turnings

Saving $15,000 With Conveyors

E. J. TOURNIER

SAVINGS in the shop are attainable not only through better manufacturing, but also through salvage of waste products. And especially by combinations of special machines with mechanical handling is it possible to obtain profitable results. One such scheme of reclaiming steel turnings produced a net profit of $15,000 in one year.

Ordinarily the practice is to gather turnings in wheel barrows and to store them until a quantity sufficient to make a car load is accumulated. In some cases the oil has been extracted; in most instances it is lost. By the use of new methods of handling and treatment, the amount of oil recovered is 10 per cent greater than formerly, the value of the scrap is increased 25 per cent, and the quantity loaded into a car is nearly doubled.

The Chevrolet plant in Bay City, Mich., has installed a system for collecting turnings, for crushing, extracting oil, conveying and storing the chips, which has had unexpected results. The installation consists of two collecting hoppers on the machine shop floor, two crushers below the floor, with two centrifugal extractors, two apron feeders for collecting chips from the extractors, and an inclined apron conveyor to transfer the material to a car-loading bin.

The collecting hoppers are placed side by side, close to the building wall, parallel to a railroad siding. The crushers being located under the hoppers, with the extractors below, permits gravity flow to and from the crushers. From the extractors the material flows directly into the feeders below the basement floor. At right angles to the two feeders is the inclined collecting conveyor, the various units being designated by name in Fig. 1.

Turnings are collected in tote boxes which are picked up at set intervals and transferred on hand trucks to the collecting hoppers. The latter discharge into crushers specially designed for this work, each having a capacity of 7 tons per hour. The crushers are separately mounted on cast iron bed plates, with a direct-connected 75-hp. 690-r.p.m. motor for each.

The special features of these ring-roll crushers are the rotor spiders which are made of cast steel, each one fitted with four manganese steel breaker rings. Two of the rings on each spider arm are "shredders" specially made for this work, while the other two are of standard design. The shredder rings differ from standard in that they have serrated peripheries which have a tearing effect, thereby facilitating the work of the plain rings. The spiders are mounted on an alloy steel rotor shaft which is carried in roller bearings rigidly fastened to the cast steel crusher housing.

The first units, 1 and 2, of the conveyor system consist of two parallel steel apron conveyors, each 18 in. wide and 20 ft. long. They are set about 10 ft. apart and arranged to discharge into conveyor 3 outside of the building. Each of the feeders with its chains, pans and terminal sprockets is supported on a light structural steel frame resting on the basement floor. The top and bottom chords of the frames are not only

Fig. 2—View in basement showing crushers and extractors, with loading end of feeders at right

structural members but serve also as tracks for the conveyor chains.

Apron conveyors are usually used under coal hoppers and are fitted with skirt boards to permit carrying a deep stream, generally on inclines less than 30 deg. For conveying material such as crushed turnings, a shallow stream is preferred, and it may be carried up very steep inclines by a special arrangement of the apron. In the present case, feeders 1 and 2 are of standard design and are driven together from one 7½ h.p. motor through open spur gear transmissions and with clutches for independent operation. By this arrangement, if one of the crushers is out of service, only one conveyor need be used.

Conveyor 3 starts below the feeders, and after passing through a tunnel rises at an angle of 40 deg. to discharge into the storage bin. This conveyor is of the same general description as the feeders, except that it is 24 in. wide, and that cleats are attached to the top of the apron to prevent material slipping back on the incline. It has an individual 7½-h.p. motor drive with an enclosed speed reducer transmission. The supporting structure of the conveyor is similar below grade to those of the feeders, but above ground it is enclosed in a sheet steel housing extending to the storage bin. Material is discharged into the bin through a chute.

The storage bin, which has a capacity of about 150 tons, is of steel plate construction terminating in a hopper bottom fitted with a hinged chute. The latter is arranged to load railroad cars, and is manually operated from the top of the car.

Fig. 3—Intersection of feeders with inclined conveyor, showing discharge of chips to conveyor

It was understood that by crushing the turnings the voids in a car load would be much reduced, and therefore a greater quantity could be loaded into a car. Also it was realized that the scrap value would be increased, and that handling would be facilitated; the reduction of the material to "shovel" size enables men to more than double the amount in a scoopful, and to shovel it more easily.

The anticipated benefits were more than realized, as the percentages already cited indicate, but other not previously calculated gains were made. These came from a totally unexpected development revealed by the purchasing department. Under the former method of disposal, the turnings were loaded into gondola cars, but a carload weight was of such a volume that it exceeded the cubic capacity of the car. It was then necessary to have wooden side boards and stakes to make up the deficiency, all of which had to be purchased. Without the high sides, an average carload was less than 15 tons, about half the capacity of the car. With the new reclamation method in operation the cars can be loaded without the side boards, and the cost of these is clear gain.

The individual operations combined here in a single system are not new, and each probably has a parallel elsewhere, but in the present instance the maximum advantage is gained through combining these processes with mechanical handling equipment.

Ball Grinding Under Difficulties

FRANK C. HUDSON

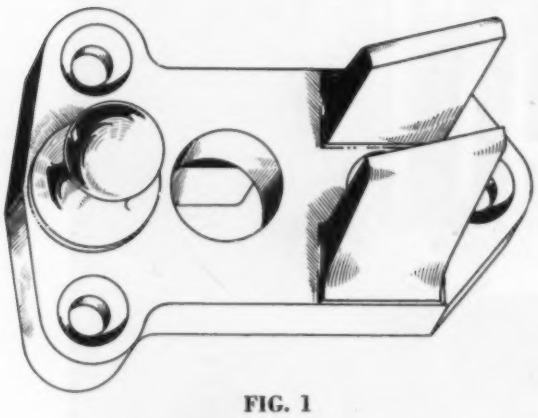

FIG. 1

Drop forged clutch finger bracket for Mack truck motor. The ball must be ground to the correct diameter without interfering with the lugs

GRINDING a ball on a piece that projects but a short distance is not an easy problem, especially when other projections limit the approach of the wheel to the work. Such a piece is shown in Fig. 1, this being a drop forged clutch finger bracket for a Mack motor. This, incidentally, gives an idea of the construction of high grade truck machinery. The two lugs originally extended out the tops parallel to the base but were finally changed to the angle shown to permit the grinding wheel to approach the ball.

A special chuck with its face at angle of 20 deg., Fig. 2, holds these brackets, shown in heavy dotted lines, by a clamping finger *A* that is controlled by a draw rod *B* through the work spindle of the grinder. The work is held in position by pressure of spring *C*, this being compressed by the hand lever to set or remove the work. The bracket rests on three hardened points under its base.

A special swinging rest for the diamond that keeps the grinding wheel dressed to the proper radius is shown in Fig. 3. This is mounted on two widely spaced ball bearings as seen in section. The diamond holder itself has a neck, or clearance to permit its full swing, as seen in the detail at *A*.

As shown in Fig. 2, the work spindle is set at an angle of 8 deg. from the center line of the table, which gives the wheel clearance shown. With the grinding wheel at the angle shown, the cutting radius reaches beyond the center of the ball in both directions. The effect of this can be seen by noting the position of the ball as held in the fixture with relation to both the wheel and the center line of the spindle. The details of the fixture construction are also of interest. The finger clamp *A* passes through a felt washer *D* which keeps particles of steel and abrasive

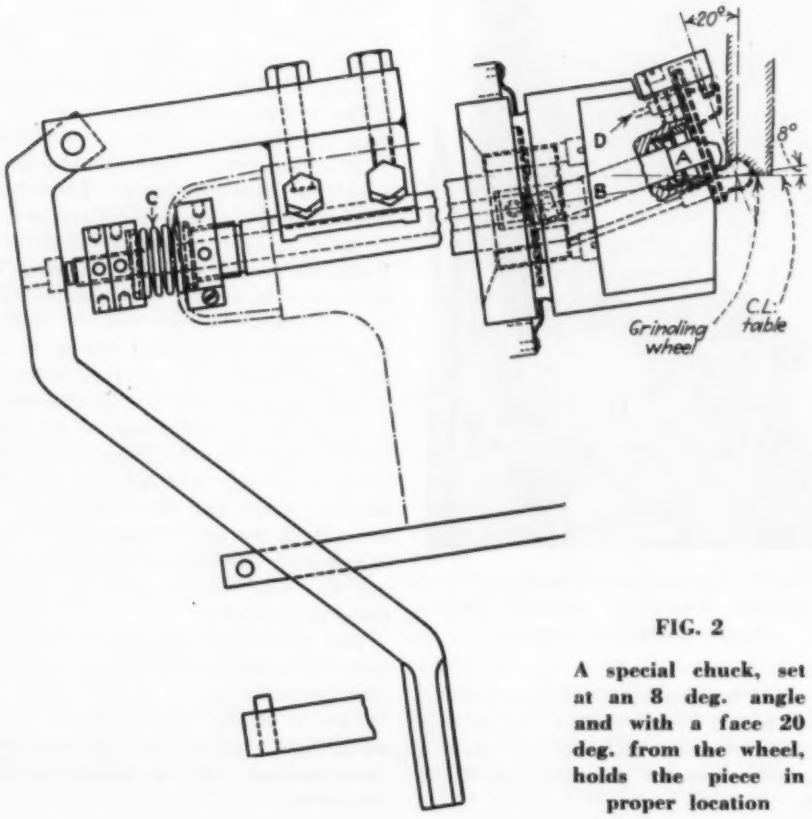

FIG. 2

A special chuck, set at an 8 deg. angle and with a face 20 deg. from the wheel, holds the piece in proper location

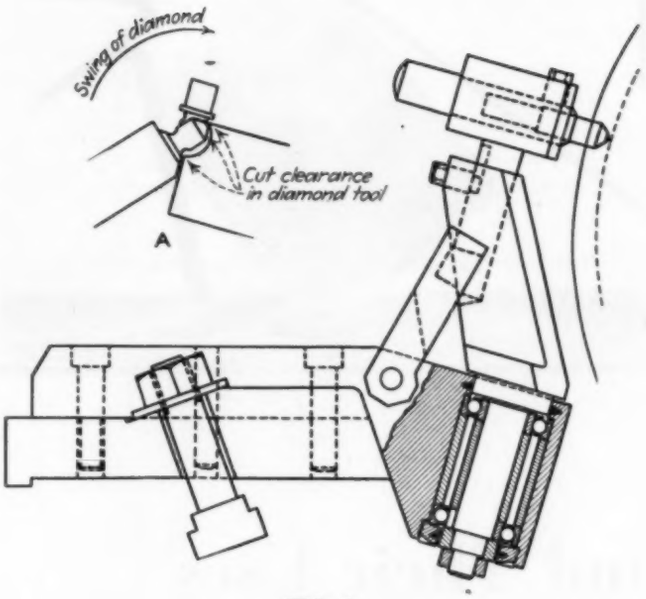

FIG. 3

Mounting a diamond holder on a ball bearing trunnion makes it easy to keep the wheel dressed to correct radius

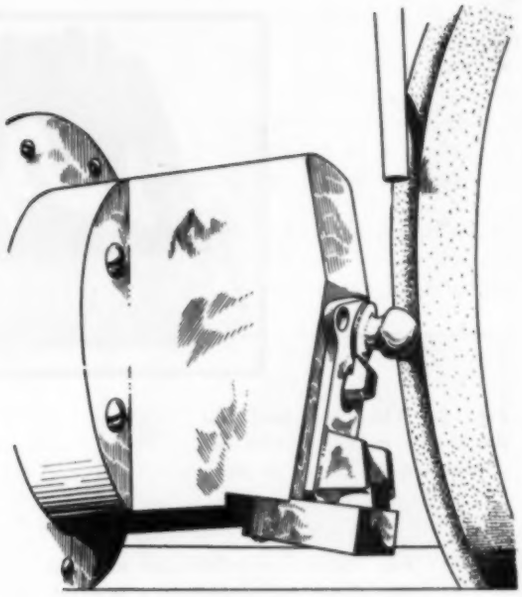

FIG. 4

Close-up of clutch finger in place on the chuck showing how the angular face keeps the lugs clear of the wheel

from the toggle inside the fixture, this toggle acting as a universal joint between the clamp and the pull rod that actuates it. Fig. 4 shows just how the piece is held against the wheel.

Another interesting feature in connection with this bracket is the way in which the ball is measured. This is done by the special gage, Fig. 5, which consists of a frame carrying two V-blocks at 90 degrees as seen at *A*. These blocks are held in position on the side of the frame, the V's being hardened and accurately ground where they contact the ball to be measured. A hardened contact point reaches between the V's to the ball surface. A multiplying bell-crank is interposed between the contact plunger and the plunger of the dial indicator shown. This gage enables the inspector to check the diameter of the ball as well as its accuracy and roundness, since the bracket can be turned in any position and swung through a wide angle.

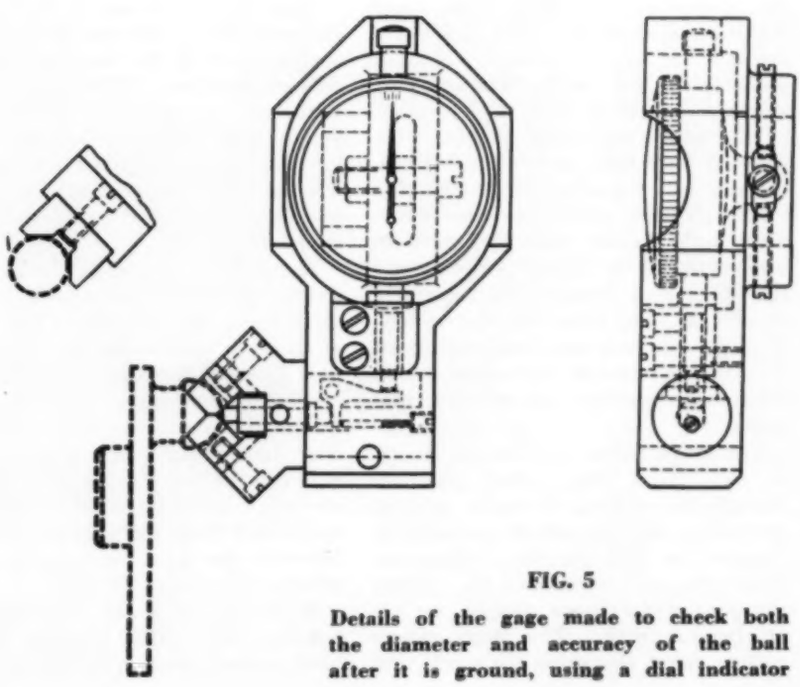

FIG. 5

Details of the gage made to check both the diameter and accuracy of the ball after it is ground, using a dial indicator

Fig. 2—When finished the die shown in Fig. 1 will cut a number of gloves at once

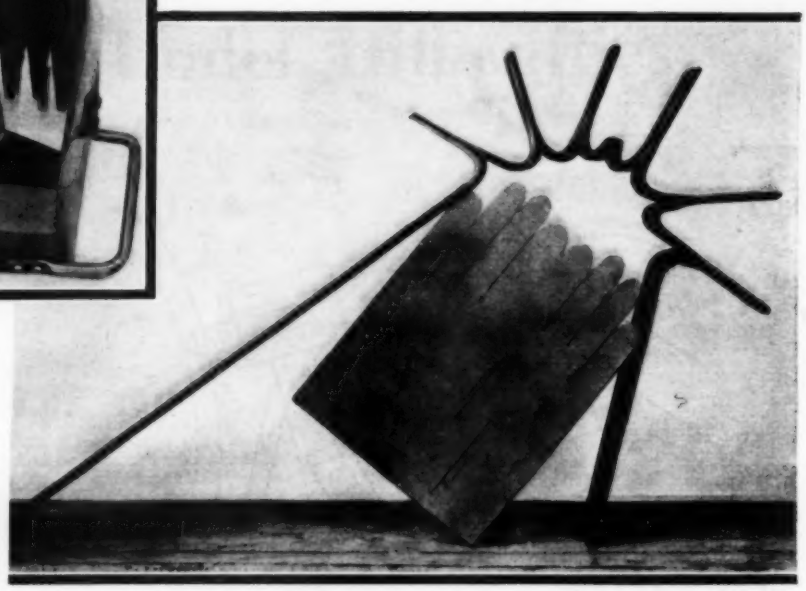

Fig. 1—Seven welds are used in this glove die, shown in a preliminary stage; the die is shaped to a cardboard pattern

Dinking Dies and Their Uses

CHESTER B. LORD

JUST when or where the first dinking die was made is a matter of conjecture. My guess would be that it originally came from England and that it was probably first used in military arsenals for cutting harness. Next it probably was used in the boot and shoe industry, but since with the exception of the army and navy supply, most shoes at that time were custom made, the general application of dinking dies to this industry must have come somewhat later. These same dies were in use at the Rock Island Asnenal, and the oldest man I could find there said they were used when he was a boy. This type of die is now being introduced into the automobile and other metal trades for cutting non-metallic materials.

The glove cutters of Gloversville, up in New York State, claim to have brought the dinking die to its greatest perfection, but this would probably be disputed by both the shoe cutters and those who use these dies for cutting the ornamental paper designs we are all familiar with. The fancy slipper cutters might also claim the credit, but personally my vote is for the glove cutter, for reasons which will appear later.

There are two types of dinking dies, and each has a different purpose. The nomenclature of the two also differs in different localities. In the glove cutters' dictionary, a dinking die is a die made to cut singly high-grade gloves. Skins for this class of product are carefully selected, and just previous to cutting, each one is stretched by hand in every direction.

The grain and luster of the leather is scrutinized, and usually only a single glove is cut from the skin. The section of the skin from which the glove shall be cut is also a matter of skilled judgment; the best part of the skin is used for the palm of the glove. When all these requirements have been met, the cutter takes his dinking die, places it over the selected place, takes his wooden mallet and dinks out a glove. The cutter must then hunt for a similar section of skin to complete the pair.

A clicking die in the glove trade is a machine die. When clicking dies are used, several skins or fabrics are cut at once, and except for a preliminary stretching when the skin is skived or brought to uniform thickness, it receives no further stretching, which explains why cheap gloves eventually become loose. It may amuse the mechanic to know that the skins are ground to a uniform thickness.

In the shoe and slipper trade, a dinking die is a heavy die for multiple production and a clicking die is a light, single-cut die, but both are used in a clicking machine. In the slipper industry, for instance, a dinking die will cut 800 dozen pair of slippers a day in multiples of 16 pairs, while the output of a clicking die during the same period will average 24 dozen using single cuts. In the shoe cutting trade, the requirements of size are so close that only a single thickness of leather is cut. The die is ¾ in. high, and the operator of the clicking press cuts from 12 to 30 pair of shoes per hour, depending upon the style.

Similar dies, whether dinking or clicking, are used for cutting silk hat linings. As many as 72 thicknesses can be cut

at one time. Most leather work that is manufactured in quantity is cut thus.

The dinking or clicking die has also invaded the automobile trade where it is used for cutting out the lining used under the cowl, doors and other body parts. When we get down to leather cutting, dies from 3½ to 6 in. in height are used, and of course thick in proportion. Such dies will cut soles, harness parts and similar articles.

Similar dies are used in the ornamental printing or embossing trade to cut out ornamental shapes and to slot or indent corners of cartons. These dies, however, are usually made of what the printers call "steel rule," to distinguish it from brass rule. This steel, which is usually ⅞ x 1 in., is fixed in a piece of plywood by means of saw cuts.

In this article, we deal more particularly with the dies used by the shoe and the glove cutting trades, particularly the latter. In the early days a straight carbon 0.70-0.80 steel was used. Some use it at present. Others of the die makers in Gloversville use an alloy steel, such as Ludlum No. 93, for making these dies. This is a steel having the following analysis:

Carbon	0.50
Manganese	0.65
Silicon	0.25
Chromium	0.70
Molybdenum	0.35

The forging temperature of this steel is from 1,750 to 1,950 deg. F. It should be heated more slowly than straight carbon steel and allowed to soak a short time. For forge welding the steel should be brought slowly up to a preheat of 1,500 deg. F., and then to 1,900 or 2,000 deg. F.

When hardening, it is preferable to heat the steel in a bath rather than an open fire. Preheating the steel to 800 deg. F. is recommended before transferring to the bath. The hardening temperature is 1,550 to 1,575 deg. F. where the bath is used, and 1,550 to 1,600 deg. F. in an open fire; quench in oil always. Draw at 450 to 500 deg. F. to hardness of Rockwell C 53-55.

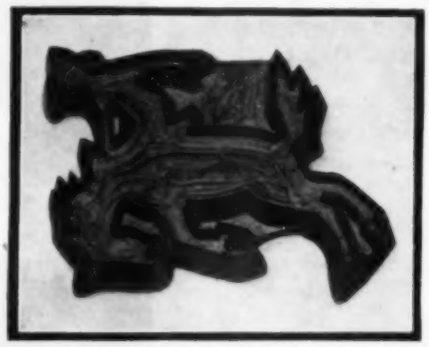

Fig. 5—An intricate design is used for ornamental leather

Dealing more specifically with the use of such dies, Fig. 1 shows the method used in making the heavier cutting dies. The steel in this case is ¼ x 2½ in. There are seven forge welds in this die which is for a man's cheap glove.

The opening at the wrist and for the thumb are cut at the same time. The die is filed and nearly finished in its present shape. It is then finish shaped, welded, and one or more bridges placed to hold the cutters for the thumb and writs slits. Fig. 2 shows the die after finishing.

In Fig. 3 is shown a double die for a glove made from knit goods. In this case the thumb also is cut because fit or style does not enter. Fig. 4 shows a die for a long silk glove. The reinforcement for the finger tips is cut at the same time and remains attached. This is a good example of die making. The claim that the glove maker has brought the dinking die to its highest perfection is based, partly, upon his skill in running a double line into a single one without showing the least bulge or unevenness, or weakening the cutting edges, and still leaving a clean-cut glove. How well this is done is shown in Fig. 4.

Fig. 5 is a good example of decorative

Fig. 3—For knit goods a machine die is employed. Fig. 4—Finger reinforcements are included in a long die for silk gloves. Fig. 6—Serrations are staggered on either side of the blade of this hard-filed die for difficult material

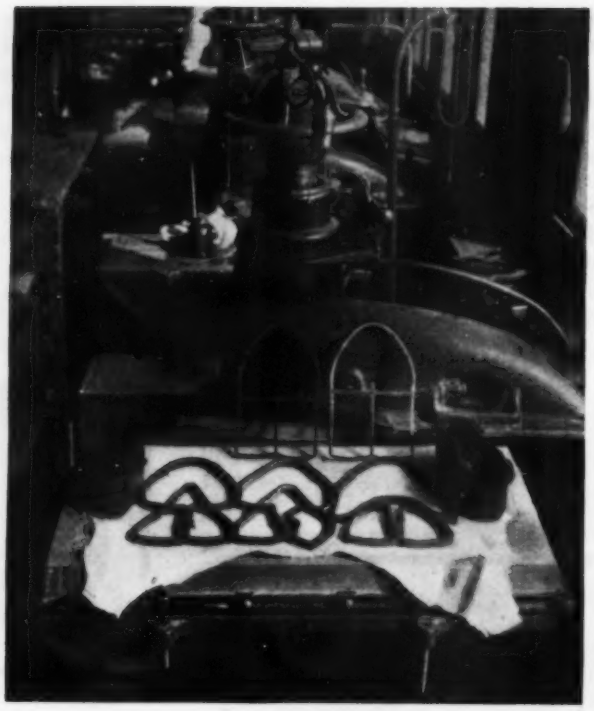

Fig. 7 — Dies for making slippers are shown on the table of a clicking press

leather cutting. It represents a cowboy on a bucking pony. A special serrated die for materials difficult to cut is shown in Fig. 6.

Fig. 7 shows some of the dies used in a slipper factory; the low ones are clicking dies, and the high ones dinking dies. The press shown is a single arm clicking press and is used only or mostly on the dies that cut but a single thickness. For heavier or multiple materials a double-arm press is used.

Deep Hole Drilling *Discussion*

FRANCIS W. SHAW
Heywood, England

Mr. A. L. deLeeuw's contribution on drilling deep holes (*AM* Vol. 76, page 1021) should enlighten those to whom it is a mystery why a drill does not always break through at a point directly opposite the point of entry. Despite a fair measure of experience in the practice of drilling, I am afraid that there are still a few things about the subject that to me appear mysterious and upon which, therefore, I would seek enlightenment.

One of the things I question is his explanation of the action of a drill with unequal cutting lips. My own view is that the only difference between the action of a truly pointed and an untruly pointed drill is that the untrue drill will make a larger hole (possibly tapering) than the true drill. If the untrue drill tends to "run" more than the true drill, that is due to its suffering less restraint from the larger hole it is drilling, and not to the difference in the pressures on its lips, which Mr. deLeeuw believes deflects the drill from its straight course.

When drilling starts, the axis of a drill of normal length, held in a spindle of normal flexibility, if its point is not concentric with its body, will sweep out in space a slight cone whose axis, so long as alignment is not disturbed by deflection in the machine or work, remains fixed. If, in these circumstances, the material being drilled is absolutely homogeneous, the drill must inevitably follow in the line of the axis of the swept out cone. If running occurs, then, it must be due, not to unequal pressures on the cutting lips, but to lack of homogeneity.

I wonder if Mr. deLeeuw has had any experience with drills held in a floating chuck or holder, such as the Barnes, familiar over here. To me the action is a veritable puzzle. Whether Mr. Barnes was hurt at my expression of skepticism or not I do not know; all the same I was accorded freedom to disprove his claims—if I could. They are:—that the drill, whether rotating in a drilling machine or stationary in the tailstock of a lathe, will drill a hole breaking out at the edge of a piece of work or into another hole, provided that the point has reasonable "foot-hold"; that, used in the lathe, the drill will float to the axis of the work and drill a concentric hole provided that reasonable care is exercised in starting and that the material is homogeneous. I found the claims justified.

Experience in center-drilling in the lathe with Slocomb drills intensifies the mystery. A drill held in a weak and untrue chuck, fed into light contact with the rotating work, scribed a circle on the work. Upon further pressure being applied, the drill started to wabble in a circle. As feeding continued, the drill seldom failed to right itself and cease wabbling. In this manner, taking care not to force the feed at the outset, I have centered bright-drawn bars so accurately that seldom did they fail to run true when between centers.

Hardening Long, Slender Tools—*Discussion*

C. F. STAPLES

In an article under the title given above (*AM*—Vol. 76, page 1233), Charles Kugler tells of a method for hardening slender tools by holding them in the chuck of a high-speed electric drill and spinning them during quenching. This method is all right providing the drill can be kept vertical without swaying, and that the tool to be quenched can be chucked quickly.

For the occasional hardening of long, slender tools I have used the following method with very good results: A braided cord is passed over a pulley attached to the ceiling directly over the center of the quenching tank. One end of the cord is equipped with a wire hook for holding the tool and the other end is held by the man doing the quenching. Before attaching the tool to the hook, the hook end of the cord is twisted and is held until after the tool has been hooked. It is then let go, and in untwisting it revolves the tool, which is dipped in the quenching bath while revolving.

Cast Iron in the Shop *Discussion*

M. P. DALTON
Sevenoaks, Kent, England

It is true, as Mr. Needham remarks *A.M.*—Vol. 6, page 216) that the designer who replaces cast iron by built up steel components is often more versatile than the original user of castings. But he could go further.

A great saving, with improved quality, has been effected by the machine tool manufacturer who uses steel plates instead of the usual box-type machine-body casting. Application of very elementary engineering principles would, however, lead to the replacement of the plates by triangulated frames at much less cost. At the same time, the uncertainty as to the direction of the strains in the plates would be eliminated.

Profits on Current Business

Electrical manufacturing has always been regarded by other branches of the metal-working industry as favored of fortune. Young, vigorous, unbound by tradition, it has aroused the envy of those who thought their profits were smaller and harder to earn. But the editor of *Electrical World* has no such illusions. Read his unsparing analysis of the tribulations of electrical manufacturing and observe how closely it fits the trials of the rest of the industry. We abstract here the parts of his article in the March 11 number of his paper that bear directly on the problems of the whole field.

L. W. W. MORROW
Editor, Electrical World

HOW can we make profits? This is the prevailing question of electrical manufacturers. They are in business to make money and they know that no business can survive without profits. They are not making profits now and most of them have made no profits for two years, so that the question reflects a serious condition for many companies. Evidence is ample that no large reserves, no efficient factory, no trained personnel and no strategic position in the markets can eliminate the necessity for profits.

Yet electrical manufacturers had a total production in 1932 aggregating $800,000,000, sold at a loss, contrasted with $350,000,000 in 1914 sold at a profit. Therefore, there must be some correlation between profits and the volume of business, the costs of business, the size of an enterprise, the organization for production and sales and the methods of doing business that both explains the no-profit status of manufacturing and indicates how losses can be turned into profits. It is difficult to define their correlation, but certain facts should be stated and certain principles applied that will turn business toward a profit-making level.

At present electrical manufacturing is organized as to structure and methods for the $2,500,000,000 business volume of 1929. Managements have skeletonized organizations, made many detail economies and used every effort to defend their organizations and policies on the premise that past business conditions and the past business volume will return. They have not applied the principle that no aspect of any business can remain fixed if profits are to be made and have neglected to make their functional activities flexible and variable to conform to market changes. The foundations for profits lie in the changing economic, sociological and psychological conditions that prevail in the markets and money is made only when these market conditions are exploited continuously in terms of economical production and profitable sales. Good business managers should always find out the buyer's judgment of values as a first requisite and then supply these values at a profit by good business methods. The mutual and ever-changing interest of producers and consumers is the gage of merit for determining the methods of business, and it is apparent that bad business conditions continue because manufacturers fail to be in accord with market conditions and prevailing economic forces. They wager their future on a return of conditions identical with that of a former period before they become bankrupt. This defensive attitude and this unwarranted optimism lead to disaster and are not complimentary to business managers, even though they are a normal human reaction to change.

Thus past history repeats itself in that business enterprises rise and fall at variable intervals and a breakdown is now occurring upon a large scale because of the application of economic penalties to past and present mistakes of business leaders. It is doubtful if any one could have built better or could have anticipated present business levels, but managements should not be forgiven for their failure to recognize presents facts and act in accord with the forces that are rectifying maladjustments. It is best to act with them, for readjustments are inevitable and will not succumb to defensive measures such as political palliatives or artificial restoratives. The alarm bells are ringing to tell business to tear down and rebuild a better and sounder structure whose foundations will be profits instead of losses. Business must capitalize its present markets and the present conditions and cease waiting for time as the only agency to change losses to profits.

Some perspective on the past growtn of business is needed to show the reasons for present conditions and the forces that have come into action. Industry is made of individual enterprises, each of which attempted to succeed by gaining all possible advantages over competitors. An inevitable increase in size occurred as a defensive as well as an offensive weapon. The use of the corporate form of organization was premised upon a greater opportunity for each enterprise to take to itself all possible legal and economic advantages. Each corporation established its own organization and determined its own business policies. Each felt free to extend its activities into broader channels without consideration of other enterprises or of any social or economic effects. Might made right in an endeavor to get advantages over competitors and make greater profits.

Growth Under Competition

In the past decade a manufacturing corporation, for example, sought to centralize its ownership and increase the scope of its activities by the use of specialized mass production factories for each product. It moved in one direction to buy or control all the raw materials it needed and in another direction to own or control all the trade agencies needed to reach the ultimate buyer with its products. In addition, it used surplus funds for stock market operations or for

carrying credit for agencies necessary for production or sales, and thus introduced banking as one aspect of its business. It often bought interests in other enterprises either to gain sales or production advantages or to introduce the idea of reciprocity in buying and selling. There were few limitations to the extension of the activities of a corporation acting under the spur of profit making in a highly competitive market. As a result of this freedom and the fierce competition many business enterprises grew into the complicated and large organizations found in 1929, when the economic collapse started. Unbridled competition was a major contributor to the death of trade.

It is doubtful if the economic and social welfare of the nation calls for artificial restrictions or limitations upon the capacity of a business management to grow because, in time, survival will depend upon economic merit and efficient management and upon nothing else. But business itself should establish rules of the game so that growth and expansion will be sound and will not violate economic and social principles, while still giving free play to intelligence and initiative in management. It is also evident that free competition may lead to disaster if it is permitted to be uncontrolled and if it leads to practices that violate sound business principles and affect the national welfare injuriously. Competition must remain and size is not dangerous of itself, but controls must be instituted and sound policies and practices must be defined by managements.

How Small Units Survived

Not all business enterprises became large, but the smaller companies survived by the use of the principle of specialization. This usually took the form of an engineering business enterprise whereby the skilled personnel plus patent protection enabled profits to be made in competition with the large companies. Both the small and the large company, in addition, developed with a new industry that had an enormous market that required a minimum of demand creation or sales effort. There were many products and all could be sold, and the method of sale consisted largely of personalized selling for both specialty and mass production industrial products and sales by resale outlets for domestic products.

With this background of development in practice and policy electrical manufacturers now face:

1. A sales volume 20 per cent of the 1929 value.

2. A factory productive capacity far in excess of the sales volume with large plants in fixed locations.

3. An organization with the number of employees, the departmentalization and the business methods suitable for past sales volumes and market conditions.

4. Hesitant and bargaining purchasers in contrast to the free spending buyers of 1929.

5. A steady decrease in financial resources and credit standing.

6. A marked decrease in the price of raw materials and an enormous decrease in the market value of past investments whether in plant, securities or employees.

7. Operating costs out of proportion to income from sales and investments.

8. Fixed capital charges on idle and often obsolete plants and manufacturing equipment.

9. A growth of competitors, in the form of small business enterprises in local markets, that take advantage of present manufacturing and marketing conditions.

10. No effective patent or legal protection against competition in mass production products.

11. A complex distribution system between factory and ultimate consumers, with costly duplications and an extreme application of the principle of specialization and concentration.

12. A continued decrease in sales volume, some obsolete and some new markets, a steadily decreasing net worth and working capital and a balance sheet record of deficits instead of net profits.

It is unnecessary to outline conditions in the electrical manufacturing business in more detail, for these conditions are common to all manufacturing and the individual enterprises find ample detail in their own business activities. The general situation is typical of the cyclic operation of business. The business tide ebbs and flows and business success depends upon alertness, competency and flexibility to meet these ever-changing, extremely complicated and unforeseen tidal changes. The present low tide has stranded American busines, which waits more or less inertly for an incoming flood tide to set it afloat again. When will it arrive? This is the chief concern of business, and yet we doubt if we will recognize it when it does arise because the present economic storms have changed the landscape permanently and the next flood tide will not leave the same marks on the old shores. We shall have another "new era" in business, but no one can predict its character or state when it will occur. All that may be done is to face present facts, measure present trends and attempt to build business to meet the new conditions.

Start Again From Scratch

The best principle to apply to present conditions is embodied in the question: If we start over in this business what will we do? An intelligent answer to this question, together with an unprejudiced and factual study of market conditions, will enable an intelligent business management to make a new start along the road that leads to profits. It is necessary first to go to the markets and determine facts and conditions as they exist. Some of the questions that should be answered are as follows:

1. What is the market for my products and can I determine the rating and classification of the customers for each product?

2. Where are the customers located, in what numerical density do they occur in each locality and what is their buying capacity in terms of unit annual purchases?

3. What do these customers require in their purchases? As to products? As to sales and engineering service? As to values? As to credit?

4. What new products are needed by customers or could be sold and what old products are now obsolete or not in demand?

5. What methods for the creation of buying demand can now be used to best advantage?

6. What kind of business mechanism is needed to supply each class of buyer with each class of products most effectively and economically?

7. What is the present business mechanism used to supply the markets? How much duplication is there? How much lack of functional definition and functional activity to sell the markets?

8. Where are the present production facilities for supplying the markets and are they properly located, of proper size and modern in manufacturing equipment and methods?

9. What is the present competitive situation in the markets? What is the condition of competitors as to credit, sales volume and business organization and methods?

10. If I were starting over in this type of business and with this market information how would I organize my business to make money and what business mechanism would I use? What would I do in association with other electrical manufacturers to increase our business efficiency and volume on a profitable scale?

In other words, the first step in profit making is a very detailed market survey on a selective, classified, geographical and product basis in terms of customer habits and desires. The object is to find what can be sold, how it can be sold and where it can be sold most profitably and in greatest volume. The second step is to study the production and sales methods needed to sell the markets. This requires a study of plant location and size, a study of product as to type and performance, a study of how far to go with direct sales and how to use resale agencies. It necessitates the use of the selective marketing principle, the application of multiple selling as well as specialization selling and the modification of a general policy better to adapt it to each market area or product, and above all the institution of controls that will give flexibility to meet market changes and still make profits.

EDITORIALS

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McGRAW-HILL PUBLISHING COMPANY, INC.
K. H. CONDIT F. H. COLVIN
EDITORS

Another New Low

Although it represents an all-time low for the history of the record, the Machine Tool Builders' announcement of an index of orders at 15.2 for February has been received with equanimity. It is not that our dread of disaster has been dulled by a quick succession of new low industrial marks during the past three years. Rather it is the realization that the extreme descent is directly traceable to the banking moratoria which during February paralyzed the conduct of business in many states. For the same reason another low index for March will not be alarming, reflecting as it will the extension of the banking holiday to the entire nation.

Perhaps those interested in records may even derive some satisfaction from this low mark. In all probability it will long remain as an indicator of the depths machine tool operations have plumbed. It may indeed be the bottom upon which machine tool manufacturers will build a sure foundation for a wholesome and persistent return to a scale of operation more closely conforming to the true needs of the metal-working industry.

Prosperity and Wages

The real test of true prosperity is the capacity of the general public to buy consumer goods. Without such buying power investment in machines and equipment may easily prove unprofitable. The situation is well summed up in the Annual Report of the president of the Sun Oil Company, of which the following is an abstract:

"Even before the depression it was plain that continued prosperity demanded the maintenance of a broad-based buying power such as could be assured only by a general program of liberal wages and salaries. If a larger share of prosperity's profits had gone to wages, there would have been more consumption and less speculation. Capital would still have had reasonable rewards, and been available in adequate supply to finance every requirement of legitimate enterprise. Even in the years when prosperity seemed boundless, and enthusiasts believed it was at last permanently established, there were some people of longer vision who had misgivings. They believed that a general disposition to distribute the fruits of prosperity more liberally among salaried and wage-earning workers would best insure maintaining the buying and consuming power of the community. That program would have been the best guarantee against the breakdown of consuming capacity which is now seen as the greatest obstacle to improved business.

"Unfortunately, these considerations were, in general, less hospitably entertained before 1929 than they have been since. A policy of more generously equipping the mass of people with buying power would have to be generally enforced to make it effective; and in a highly competitive industry it is apparent that there are sharp limitations on free choice in following such a course."

The Sun Oil Company has followed these precepts to the extent of keeping its force practically intact and maintaining its wage scale. Business men generally agree that purchasing power must be increased before any real semblance to prosperity can be expected. Some are already restoring a portion of the wage cuts that have taken place and are turning their attention to economies which affect the cost of the product to a much greater extent than wages.

We should not forget that all machine development has been spurred by high wage rates and that the greatest incentive to retiring obsolescent machinery is a wage much higher than the current scale.

Significance of the Appalachian Coals Decision

Members of trade associations in every industry are affected in one way or another by the decision recently handed down by the United States Supreme Court in the case of the U. S. vs. Appalachian Coals, Inc. The decision was a complete surprise to many lawyers and represents what competent observers say is the most important advance in liberalization of interpretation of the Sherman Anti-Trust Act in more than twenty years.

Appalachian Coals, Inc., is a sales organization set up by soft coal producers in the Pittsburgh area to test the legality of group selling by producers in a geographic area. It sold one carload of coal and on this sale the test case was brought. Trade associations in other raw material fields were interested in the case and their counsel participated in the trial as friends of the court.

The decision represents a further broadening of the "rule of reason" opinions of 1911. At that time the court held that all combinations are not necessarily illegal, but that the test was whether they constituted an unreasonable monopoly.

In this decision the court says, "The fact that the correction of abuses may tend to stabilize a business,

or to produce fairer price levels, does not mean that the abuses should go uncorrected or that cooperative endeavor to correct them necessarily constitutes an unreasonable restraint of trade." Heretofore the only legal way to arrive at the end sought by the Pittsburgh coal producers has been to merge the various companies into a corporation.

The court also observes that conditions in the coal industry are such that there is no reason to believe that the producers in one area will be able to fix the price of coal in the consuming markets. This calls attention to the fact that cooperative action of an industry is not involved here. The defendants represent only one of the several soft coal producing areas. Jurisdiction in the case is returned to the lower court with the understanding that the sales corporation will go ahead and operate. If its activities result in unreasonable restraint of trade then the case will be reopened.

It seems fair to conclude that the Supreme Court has stepped a little further away from the purely legalistic interpretation of the Sherman Act, and that henceforth we may expect a more lenient attitude toward cooperative trade activities that are not in conflict with the public interest. This attitude should be encouraging to honest trade associations and their members. They should remember, however, that the courts will continue to judge every case on its merits and that they must be sure that whatever they may do to correct abuses in their respective industries is not contrary to public interest.

• CHIPS •

President Roosevelt continues impressive program of accomplishment by signing economy and 3.2 beer measures . . . gets radically different experimental farm relief measure through the House and offers plan for enlisting 250,000 unemployed in a vast reforestation project . . . Organized labor objects to the dollar-a-day wage contemplated in the bill . . . Plans for farm and home mortgage relief and tariff adjustments next in order at Washington.

Seventy per cent of our banks are operating normally again . . . General Motors subscribes $12,500,000 cash, matched by R.F.C. loan, to open new National Bank of Detroit . . . Many Detroit plants resume operations . . . Senate committee, at behest of President, resumes investigation of Wall Street practices concentrating on private banks and trust companies . . . Charles E. Mitchell indicted for alleged income tax evasion . . . Marcus and Singer start prison terms.

Disturbed by European war scare MacDonald consults Mussolini, then French officials in effort to preserve peace . . . Mussolini proposes four-power peace pact which may be joined by other nations . . . France naturally objects because it would mean scrapping Versailles treaty and end of her dominant position in European affairs . . . Swastika flags fly over Germany as Hitler widens his control . . . replaces Luther by Schacht as head of Reichsbank . . . German business and industry not particularly upset by coup . . . Soviet secret police seize six British engineers charged with sabotage . . . British Parliament much upset . . . American engineers start to leave country despite Stalin's letter to American newspaper correspondent assuring their safety . . . England breaks off trade treaty negotiations with Russia . . . Japanese government takes absolute control of foreign exchange . . . Tension on Northern Chinese and South American fighting fronts diminishes . . . Threatened with Soviet defaults German banks renew loans.

Legal beer on April 7 . . . New York brewers plan expenditures of $30,000,000 . . . brewers elsewhere will spend corresponding sums . . . Secretary Perkins calls conference of labor leaders on unemployment relief . . . starts reorganizing bureaus in Department of Labor as funds run out . . . Senator Wagner reintroduces bill for nation-wide employment exchanges . . . also one setting up system of unemployment insurance and wage reserves . . . Pittsburgh soft coal producers go ahead with group sales plan on strength of Supreme Court's Appalachian Coals decision . . . 1,000 New York State unemployed given jobs training 20,000 other idle citizens.

F. H. Prince advocates grouping railroads of country into seven regional systems . . . Railroad presidents go him two better, make it five . . . Britain to help Cunard build super-liner on condition White Star builds sister ship for cooperative service . . . Japanese buying steel scrap in New York as well as on west coast . . . Toll business on telephone lines increases sharply . . . Construction to start soon on Continental Can plant at Houston, Texas . . . Globe-Union Manufacturing Company orders 500 carloads of materials to restock inventories, increases hourly and piece rates ten per cent . . . Cord gains control of Aviation Corporation and puts in his own officers . . . Friendly receivership ordered for Studebaker Corporation . . . operations to continue . . . Anthracite miners succeed in blocking arbitration of wage cuts.

Electrical energy production drops a little farther behind the 1932 figure . . . Steel ingot production still low but sales of pig iron and scrap improve and prices rise . . . Non-ferrous metal prices drop back on lack of consumer buying but producers are optimistic . . . Food index rises . . . Engineering construction lower in February . . . Investigation shows that properly constructed buildings withstood California quake.

Economic Conference to Be Held in August

With the cooperation of the A.S.M.E. and other engineering societies, the Economic Conference of Engineers, initiated by Stevens Institute of Technology in 1931, will be held this year on August 12 to 20. The place of meeting will be the engineering camp of Stevens Institute near Johnsonburg, N. J.

The purpose of the conference is to bring the engineer up to date in current economic thought and to interpret to the public his point of view. The general theme will be announced later, one suggestion under consideration being "New Developments in Banking and Currency."

French Machinery Imports Exceed Exports

French exports of machinery for 1932 fell 40 per cent below the 1931 figure according to the Industrial Machinery Division of the Department of Commerce. This compares to a 35 per cent decline in the total French export trade. The value of exports in 1932 was 510,495,000 francs as against 848,491,000 francs in 1931 with the franc approximately equal to 4 cents, U.S.

Imports of industrial machinery made by France amounted to 715,923,000 francs compared to 1,407,304,000 francs in 1931, a decrease of about 49 per cent. The total decline in France's import trade was 30 per cent.

The decline of 45 per cent in French foreign trade in machinery was not only heavier than for foreign trade as a whole but also exceeded the 30 per cent drop in French machinery production. France is still an importing nation for machinery since its imports of industrial machinery for 1932 exceeded exports by about 40 per cent. During 1932 French machinery imports were about 12 per cent of total consumption while in 1931 they were 13 per cent.

This loss in French foreign trade in industrial machinery was ascribed by the local trade to the general industrial inactivity, minimum establishment of new factories, French quotas on many items of machine tools and several other types of machinery, while nationalistic feeling proscribing purchase of goods abroad increased during the year. Competition from second-hand machinery, mainly from German and French plants that were closed, was felt more severely during 1932.

Germany is the leading supplier of machinery to France, selling more than five times as much as the United States or Great Britain, the nearest competitors. In 1932 the United States ranked second as supplier to France, a position held by Great Britain in 1930 and 1931. The decrease in 1932 of Germany and Great Britain is considerably greater than that sustained by the United States.

Replacement parts, machine tools, embroidering machinery, textile and paper-making machinery constituted in the order named the chief items of industrial machinery imported into France during the year. France's principal export customers during 1932 were Algeria, Belgium-Luxemburg, Great Britain, Spain, Germany and the United States.

Exports of Machinery During February, 1933

	Feb., 1933	Jan., 1933	Feb., 1932
Electrical machinery	$2,461,271	$3,085,903	$4,344,256
Power generating machinery (except electric and automotive)	750,210	220,538	751,541
Construction machinery	237,176	203,490	289,483
Mining, well and pumping equipment	882,606	990,571	1,009,425
Power driven metal-working machinery	750,210	576,134	1,273,960
Other metal-working machinery	100,572	93,734	293,503
Textile machinery	281,888	332,049	485,012

Exports of Metal-Working Machinery During February, 1933

	Feb., 1933	Jan., 1933	Feb., 1932
Engine lathes	$88,101	$17,333	$121,215
Turret lathes	22,813	12,187	22,848
Other lathes	9,693	13,057	19,155
Vertical boring mills and chucking machines	24,165	7,800	47,105
Thread cutting and automatic screw machines	30,101	1,546	31,087
Knee and column type milling machines	33,610	32,140	18,864
Other milling machines	13,768	23,840	100,849
Gear-cutting machines	19,046	44,826	63,395
Vertical drilling machines	9,184	4,199	34,636
Radial drilling machines	.....	29,035	.....
Other drilling machines	6,065	27,312	11,281
Planers and shapers	2,242	1,068	61,421
Surface grinding machines	24,123	6,569	25,328
External cylindrical grinding machines	64,701	18,394	49,582
Internal grinding machines	29,106	2,515	46,005
Tool grinding, cutter grinding and universal grinding machines	24,213	29,814	67,746
Other metal grinding machines	28,737	20,710	37,125
Sheet and plate metal working machines	83,762	48,424	66,036
Forging machinery	9,041	9,277	151,719
Rolling mill machinery	1,255	9,734	30,317
Foundry and molding equipment	51,315	52,044	43,450
Other power driven metal-working machinery and parts	175,349	164,310	224,796

Other Metal-Working Machinery

Pneumatic portable tools	14,772	10,953	42,624
Other portable hand operated machines and parts	32,106	19,299	33,135
Chucks for machine tools	2,646	2,892	3,949
Machine operated pipe and thread cutters, socks, dies, taps and other machine operated cutting tools	33,912	41,674	177,109
Other metal-working machine tools	17,856	18,920	36,686

INDUSTRIAL REVIEW

For the machinery trade the first quarter of 1933 ends with little to boast about but hope for the future. Although the prompt recovery of the country after the banking holiday is most encouraging, machinery distributors and builders have practically no orders on their books. At the present writing there is little expectation of any marked improvement during the second quarter.

One order of some importance was placed in the New York territory but otherwise there was practically no activity. Inquiries are becoming more active in New England, as reported by Boston headquarters, but orders are as scarce as ever. Philadelphia says that there is no evidence of any release of pending orders.

Pittsburgh, likewise, has nothing to report in the way of business, but remarks on the swing of business sentiment to support of President Roosevelt. The immediate future in Cleveland is not bright but the longer heads are looking forward to some real business in the second half. Cincinnati's banks are in good shape but the machinery plants are still practically closed because of lack of business. A few likely inquiries have come in.

Without banks for more than a month, it would take even a more optimistic city than Detroit to function normally. Plants are reopening cautiously but at a rate that promises little for machinery suppliers for several months. St. Louis reports feverish activity by brewers and suppliers of brewing equipment and supplies but a total lack of machine tool orders. Prospects in Chicago are more willing to talk but they are not signing on the dotted line. Milwaukee, like St. Louis, is stimulated by brewing activity, but machine tool business is nil. Here, also, President Roosevelt is winning the support of many who did not vote for him.

Muller Acting Head of Machine Tool Builders

E. A. Muller, president of the King Machine Tool Co., Cincinnati, and first vice-president of the National Machine Tool Builders' Association, will act as president until the next meeting of the

board of directors. Mr. Muller's action is made necessary by the resignation of President H. S. Beal who has left the machine tool industry to become president of the Sullivan Machinery Corporation.

Machine Tool Orders Sag

Because of the effect of influences which led to the nation-wide bank holiday, the machine tool industry came practically to a standstill. The February index of orders compiled by the National Machine Tool Builders' Association reached a new low at 15.2. Foreign orders which did much to maintain January's comparatively fair showing fell off with the rest, representing only 28 per cent of the reduced total as compared with 48 per cent in January.

Shipments though maintained at practically the same rate as the previous months resulted in a sharp reduction in unfilled orders, leaving only about one and a third month's shipments at the January-February rate.

While the figures in themselves are gloomy they must be considered in the light of unprecedented national conditions which eclipsed all industrial activity. It should be remembered that the month's figures, representing a period of state banking moratoria, serve neither as a basis of comparison nor as indication of a trend.

Swedish Machine Industry is Spotty

Sweden's machine industry in 1932, although in many cases disturbed by the economic depression, in others showed surprising activity. This appears from an investigation made by *Swedish Export*, organ of the General Swedish Export Association in Stockholm, and released by the American-Swedish News Exchange.

The Separator Co., of Stockholm, leading concern of its kind in the world, fully maintained its share of the total sales of cream separators and dairy equipment in the international market, but because of the agricultural crisis its total sales amounted to only between 40 and 50 per cent of those in 1931. The depreciated rate of exchange of the Swedish krona, which makes the prices of the company's products in the gold standard countries more attractive, only partly neutralized the effect of the depression.

The Karlstads Mekaniska Verkstad, which together with its subsidiary works in Kristinehamn, manufactures a series of important specialities including water turbines and machinery for paper and pulp mills, reports orders during the past year amounting to about twice the value of those in 1931. This company for a number of years has considerably expanded its markets in spite of the heavy foreign competition.

The Elektrolux Works, located in the capital, manufacturers of vacuum cleaners, household refrigerators, and water filters, reports a decrease of exports from the Swedish works because of raised customs barriers, while the output of its foreign works increased so that the total world sales for the past year appear to exceed those of 1931.

The electric industry, chiefly represented by the ASEA Co., in Vesteras, in spite of a decrease in export held its own well, thanks to large domestic government orders, mainly for the electrification of the Swedish state railways.

The motor works suffered considerably in their foreign business from international trade obstructions while domestic orders kept up fairly well.

The ball-bearing industry as represented by the S.K.F. Co., in Gothenburg, maintained on the whole its export sales well in comparison with 1931, partly because of the lower rate of the krona, which enabled the company to reduce its prices in foreign currency. The overseas factories of S.K.F. strongly felt the influence of the crisis. The last two months of last year, however, brought a distinct improvement in sales.

The automobile industry, as reported by the Volvo Co., also of Gothenburg, had a rather good year. Thus in 1932 this firm sold 2,545 passenger cars and trucks, of which 590 were for export in comparison with total sales during 1931 of 1917 cars, or an increase of about 33 per cent.

Simplified Practice Designations

Manufacturers of items conforming to simplified practice recommendations have been asked by the Simplified Practice Division of the Bureau of Standards to identify them in catalogs and other trade literature. In addition, this practice should be followed in handbooks, price lists, pamphlets, tags, labels and in advertising.

More than 11,000 concerns have now accepted one or more recommendations and over 400 organizations have agreed to designate their simplified lines in trade literature. For instance, 80 per cent of wheelbarrow manufacturers have abandoned their old stock numbers and have adopted the numbers used in the simplified practice recommendations.

Another example of the benefit of this plan to purchasers is the use of black-faced type in the catalogs of locker manufacturers to indicate the simplified sizes. Those who contemplate future purchases would not buy from a line soon to be discontinued.

February Orders for Machine Tools

	Index A	Index B	Index C	Total
Number of reports	23	27	22	72
Class bases	$2,423,861	$637,003	$127,279	$3,188,143
Gross orders for month	15.6	12.4	20.5	15.2
Cancellations	0.1	0	0	0.1
Net orders	15.5	12.4	20.5	15.1
Shipments	28.3	19.8	31.9	26.7
Unfilled orders	29.2	52.8	62.4	35.3
Three months' average of gross orders	27.9	23.5	40.6	27.5

Base — Average shipments for years 1922-24.
Index A — Base more than $50,000.
Index B — Base $10,000 to $50,000.
Index C — Base less than $10,000.

Total — The "total" indexes are not average of A, B, and C indexes but are percentages of the totals of the respective items to the total bases of all reports filed each month.

Machine Tool Trends at the Leipzig Fair

LEIPZIG—Machine tool designs shown at this year's Leipzig technical fair exploit the qualities of hard metal and carbide tools by wide speed and feed ranges, ample provision for chip clearance, adequate bearings free from shake and satisfactory lubrication. Efforts have been made to build machine tools so that a certain guarantee as to their working accuracy may be given. High-grade plain bearings are still generally preferred for main tool or work spindles, while anti-friction bearings are used on secondary high-speed shafts. For grinding machines, however, fast-running spindles are supported by adjustable anti-friction bearings free from axial and radial backlash.

Smooth Drives

In addition every effort has been made to balance fast-rotating parts, to smooth all reciprocating feed motions, and to avoid a final drive to the main spindle by gears giving cause for chatter. Stiffness has been obtained by the use of welded steel structures, but such designs have been restricted to the frames of presses and shearing machines, where accuracy requirements are not great. Only in the case of the Diskus Werke machines have welded steel members been applied to grinders.

However, some cast iron, cast steel or semi-steel beds and tables have been displaced by special alloyed steels with additions of silicon, chrome and nickel to add stiffness and wear-resistance without the necessity for chilling. Some wearing surfaces are chrome plated. Scarcely without exception highly stressed ground gears and spindles are made of heat-treated chrome-nickel steel. The change gears slide on ground multi-splined shafts. In some cases, spindles and worms are made of nitrided steel.

Central circulation and forced-feed unit systems are popular for lubrication. Machine parts of secondary importance, such as handwheels and levers, are often made of light metals.

To shorten non-productive time, machine tools are equipped with quick clamping devices of hydraulic, pneumatic, magnetic or electro-mechanical types, while intermittent feed and quick traverse and return motions are common. Stop mechanisms for obtaining predetermined lengths are in practice on turret and vertical lathes and horizontal boring and milling machines. Tools may be exactly adjusted and aligned by scales and verniers. In one instance, fine adjustments are made by the application of Zeiss magnifying lenses.

Calipers and microtasts are frequently employed for size control, the instruments indicating size while the machine is running. For quantity production automatic size control is employed and on grinders is arranged to compensate for wheel wear.

Hydraulic drive for maintaining the sensitive tool edges of tungsten carbide and avoiding shocks and vibrations is popular. A Collet & Engelhard horizontal boring and milling machine has a reversible hydraulic drive for the spindle, faceplate and feed mechanism. The Strum hydraulic drive has been improved so that oil speed is reduced, allowing the transmission of speeds up to 3,000 r.p.m., and power up to 150 hp. A Wotan-Zimmermann shaper has a built-in main driving motor and hydraulic drive to the ram and table cross-feed. A new shaper by Friedrich Klopp has a combined high- and low-pressure pump, giving a return speed independent of the stroke and of the cutting speeds.

On a Deutsche Niles wheel tire boring lathe, a novel clamping device has been incorporated which centers and grips the work by the operation of a lever. A large centerless grinder exhibited by W. Herminghausen is guaranteed to produce work within ± 0.001 mm. The diamond truing devices are hydraulically operated and may be adjusted to templets to obtain a permanently true dressing of the two wheels.

Lapping Pressure Adjustable

In a new lapping machine by Hahn & Kolb the upper disk is hydraulically lifted and lowered, the pressure against the work being adjustable and indicated by a gage. On a cold saw, Gustav Wagner uses a variable hydraulic feed regulater to give a constant cross-sectional cut per unit of time. Hydraulic pressure is also used for clamping the work.

The Kärger precision lathe is adapted for fine-turning or size-smoothing operations by means of tungsten-carbide tools. Hahn & Kolb show a two-spindle fine-boring machine working with carbide or diamond tools and hydraulic table drive. Another machine by H. H. Klussendorf reverses the usual procedure and rotates the tool while the work is held stationary to avoid centrifugal distortion during fine diamond turning. Mayer & Schmidt prefer reboring and honing at one work-setting. In the Hille-Werke machine a reboring and a honing tool are arranged side by side, and the cylinder is adjusted horizontally by measuring rules and verniers.

Bëché & Gross show a new hammer in which two tups are used. They are driven in opposite directions avoiding the necessity for heavy foundations and eliminating vibration. A Heinemann multi-tool turret lathe has eight headstock speeds. A laminated disk clutch is automatically disengaged when speed changes are made. The Werner automatic gear lapping machine is the only newcomer in this group.

An example of a universal milling machine capable of replacing a special-purpose machine is the Thiel duplex, which may be used both for precision and production work. In another universal machine exhibited by G. Kärger the main spindle can be adjusted from horizontal to vertical.

Radial Drills

The Kolb radial drill is provided with a semi-automatic central power locking system which clamps simultaneously the head, arm and column. In the Raboma radial, the controls are centralized, and the feeds and speeds are controlled selectively by operating a single lever. A dial index shows the required spindle speed for a given roll and the setting appears at a window opening. In the Schutte upright drills the feed mechanism acts on a flat slide on which the bearing spindle may be adjusted. This machine may be easily changed over to a multi-spindle drill with a motor-driven rotary table.

A new Thiel development is a heavy-duty metal bandsaw for cutting heavy punches and dies. Hydraulic bakelite presses shown by Hahn & Kolb have rotary tables to receive two single or multiple molds, one of which is filled while the other is pressed. A new Götz power press for bakelite moldings is preloaded by four shrunk-in steel tie-rods. Heavy-duty presses by Weingarten include a 400 metric ton coining press for sizing to close tolerances. An attachment for an automatic high-speed punch press for feeding metal strips is built by Hiltmann & Lorenz. This device has a magazine feed. A Kircheis attachment is used for feeding metal sheets lengthwise and crosswise under the punch to use the maximum amount of stock.

In a Pels roll-shearing machine, the shear, which has power-driven circular knives, is mounted on a movable frame. The Deckel engraving machines use a

three-dimensional pantograph system for the fabrication of dies and molds.

A Messer double welder welds two spots simultaneously. A Knopp machine is designed for the quantity production of zinc cups by cutting sheets into parallel strips, bending them round into sleeves and then automatically seam-welding.

King Heads Fosdick Co.

After sixteen years of service with the Fosdick Machine Tool Co., N. B. CHACE has resigned as president to devote his time to other business interests. GEORGE G. KING succeeds him as president with F. C. TUTTLE as secretary-treasurer and W. R. HOFFMAN as manager.

Messrs. King and Tuttle are, respectively, president and vice-president of the Peters Cartridge Co., which now owns the Fosdick Machine Tool Co. Mr. Hoffman has been associated with Fosdick in an executive capacity for a number of years.

Tool Engineers Elect

At the regular meeting of the board of directors of the American Society of Tool Engineers on March 16, the following officers were announced for the year 1933:

President—WILLIAM H. SMILA, tool engineer, Chrysler Corporation.

First vice-president—FRANK HARTLEP, chief tool engineer, Timken-Detroit Axle Co.

Second vice-president—T. B. CARPENTER, assistant tool supervisor, General Motors Truck Corporation.

Secretary—A. M. SARGENT, president and general manager, Pioneer Engineering & Mfg. Co.

Treasurer—JOSEPH F. SLAVIK, sales engineer, Warner & Swasey Co.

Mr. Smila succeeds J. A. SIEGEL, assistant chief tool engineer, Packard Motor Car Co., who has been named chairman of the meetings committee.

• PERSONALS •

MAURICE H. PEASE, formerly assistant secretary, Stanley Works, New Britain, Conn., has been elected a vice-president to succeed MALCOLM FARMER. Mr. Pease will be in charge of the steel division. MAXWELL A. COE, general manager of the Stanley Rule & Level Co., was elected a vice-president and will have charge of the hand tool business.

J. M. BURDICK, general superintendent of the Stanley Rule & Level Co., New Britain, Conn., was recently elected a director of the Union Mfg. Co., New Britain.

D. M. COMPTON, vice-president, general manager, treasurer and a director of Grigsby-Grunow Co., Chicago, has resigned. He has been succeeded by LE ROI J. WILLIAMS, formerly assistant to the president, who has been made vice-president and general manager.

EDWARD WALTER FORSTROM, tool designer of the Bridgeport (Conn.) plant of the General Electric Co., was recipient of the Coffin award in recognition of unusual ingenuity and skill in solution of problems in connection with rapid and efficient manufacture of wire.

•BUSINESS ITEMS•

At the annual meeting of the Bullard Co., the following officers were elected: E. P. BULLARD, president; E. C. BULLARD, D. B. BULLARD, J. W. BRAY, vice-presidents; A. E. NORTH, secretary-treasurer; and G. L. TODD, assistant secretary-treasurer. LEONARD S. HORNER, formerly vice-president and a director, resigned prior to the annual meeting.

The Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich., will be represented in the Toledo territory by RAY LINN, 1432 Jermain Drive. Mr. Linn will represent the Continental Tool Works and Krueger-Wayne Tool Co., which are divisions of Ex-Cell-O, and also will have representation for all products of Ex-Cell-O.

At the annual meeting of J. A. Fay & Egan Co., Cincinnati, Ohio, a number of changes were made in the personnel. S. M. BLACKBURN, new president and general manager, was formerly vice-president and general manager of John B. Morris Foundry Co., and vice-president of Morris Machine Tool Co. CLIFFORD P. EGAN becomes vice-president, and ESPY BAILEY, formerly treasurer and auditor, becomes secretary and treasurer. R. W. EGAN and F. T. EGAN, formerly president and vice-president respectively, have retired. The company is planning to redesign and improve its line of woodworking machinery.

At its annual meeting the board of directors of the Square D Co. elected the following officers: F. W. MAGIN, formerly executive vice-president, as president; H. S. MORGAN, secretary-treasurer; and J. H. PENGILLY of Los Angeles, L. W. MERCER, and C. M. HIGBIE, vice-presidents.

The Strong, Carlisle & Hammond Co., Cleveland, Ohio, has been made national distributor for the Lenney variable-speed transmission and is maintaining a stock of sizes up to 1½ hp. The transmission operates on the over running-clutch principle.

• OBITUARIES •

THOMAS F. FERRY, 61, one of the founders of the Ferry Cap & Set Screw Co., Cleveland, died March 22. Mr. Ferry secured his early training in cold upset work as an apprentice at the Falls River & Machine Co., Cuyahoga Falls. Later he became associated with the National Screw & Manufacturing Co., which was at that time the National Screw & Tack Co., finally reaching the position of superintendent. Later in 1906 he and W. G. NORTH organized the Ferry Cap & Set Screw Co., of which Mr. Ferry had been president for the last 20 years. H. D. NORTH will act as president until a head is elected.

CLARE CURTISS GAMBLE, formerly treasurer of the Geometric Tool Co., New Haven, Conn., died recently. Previously, Mr. Gamble was connected with the Allied Machinery Co., New York.

JOHN MCMYLER, a pioneer in development of unloading machinery, died March 20. He was the founder of the McMyler Mfg. Co., Bedford, Ohio, which later became the McMyler Interstate Co., an affiliate of Industrial Brownhoist Corp.

• MEETINGS •

AMERICAN GEAR MANUFACTURERS ASSOCIATION. Annual meeting, May 4-6. Penn Lincoln Hotel, Wilkinsburg, Pa. J. S. MCQUISTON, managing secretary, First National Bank Bldg., Wilkinsburg, Pa.

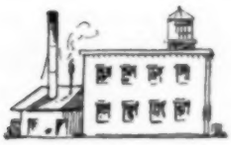
AMERICAN MANAGEMENT ASSOCIATION. Division meetings—job order production and mass production. April 13-14. Hotel Statler, Cleveland, Ohio. K. B. ANDERSEN, secretary, 20 Vesey St., New York, N. Y.

AMERICAN SUPPLY & MACHINERY MANUFACTURERS ASSOCIATION. Annual meeting. May 8-11. Louisville, Ky. R. KENNEDY HANSON, secretary-manager, Clark Bldg., Pittsburgh, Pa.

AMERICAN WELDING SOCIETY. Annual meeting. April 27-28. New York, N. Y. Miss M. M. KELLY, secretary, 29 West 39th St., New York, N. Y.

NATIONAL FOREIGN TRADE COUNCIL. Twentieth national foreign trade convention. April 26-28. Hotel William Penn., Pittsburgh, Pa. GARDNER L. HARDING, secretary, India House, Hanover Square, New York, N. Y.

THE ROUND TABLE



Renovizing

"In your new shop, yet, Al?" asked Ed, as the two friends met at their periodic lunch together.

"No, Ed, we don't expect to move for some time."

"Why not? What's the use of leasing an expensive property and letting it stand vacant? Looks like you didn't need the extra room in the first place, or else you're wasting time and money."

"Quit kidding, Ed. You're as bad as Mason. He knows better, but he seems to think, as you do, that after leasing the place, all we have to do is to move in. I told him we won't move until the place is fixed as I want it."

"You told me that the place was in excellent condition, didn't you?"

"Yes, the plant is in splendid physical condition, as a whole, but there are a lot of little things I want to do to make it still better."

"What, for instance?"

"Well, among other things, I want to rearrange the lighting, do something to lighten up the walls, and put a hard maple floor in the assembly room."

"How much do you figure the changes will cost?"

"I think five hundred dollars will cover it."

"That means about seven hundred. To change the subject for a second, how many orders have you on hand?"

"I don't recall exactly, but we have several actual orders, and a whole slew of conditional orders that should be released soon."

"Well, under the circumstances, Al, don't it strike you as better business to do the necessary moving and be ready for increased business, and let the fixing up go until later?"

"Are you, as a stockholder, criticising my procedure?"

"Not at all, Al, I'm just trying to look at both sides of the question. It strikes me that seven hundred dollars spent on small tools and fixtures would be more of a convenience than smooth floors and lighter walls; that early production, in this case, is more important than ideal working conditions."

"Maybe it may seem so, but on the other hand, my experience, time and again, has taught me that the cost and quality of a job is entirely dependent upon the thoroughness with which the job is planned and prepared. If that is so, it must apply still more to a business as a whole, even if it is a small one."

"Within certain limits you may be right, Al, we certainly have to have a building, machines, material and labor in order to start manufacturing. But there are thousands of little things that go wrong because of a combination of time and conditions, and no man can control them beyond a certain point and certainly cannot anticipate what will happen, or when. Such things have to be taken care of as they arise."

"You are jumping from one extreme to the other, as usual, Ed, from fundamental to detail. If I rearrange the lighting now, I won't have to install drop lights all the time, and if I paint the walls now, I won't need as much light on dark days."

"Even if you do change the lights and fix the floor, you're only delaying trouble. In time the floor will again need repairs, someone will not be satisfied with the lighting and the walls will be dirty. With small things trouble happens oftener and sooner. So I claim you will be farther ahead by starting manufacture as soon as you can and fixing things when you must."

"I don't agree with you, Ed. I'd call that half-baked management."

"Yeah? Well there are lots of things that are better under-done than over-done."

Is Al too fussy in preparing the new plant? Would he be wiser to spend the money on tools and equipment?

Discussion

High Finance

When Ed can buy the stock of any one of a number of old established companies for less than par, he would be showing poor judgment to buy stock in Al's company under the conditions proposed. Al admits that the book value of his concern is only $10,000, yet he wants to sell additional stock at par although it represents nothing but good will; a new enterprise such as his has little if any good will.

If Ed buys the stock of some well known company and finds at a later date that he needs money, he can sell the stock within an hour and have his check the next day, while if he wants to dispose of stock in Al's company, his only customer is Al and Al's ability to

buy is doubtful. He has already invested practically all of his quick assets in the company, and therefore might find that he could not make good his promise to buy the stock. If business was not going well with the company, he could not get any money out of it, but would probably be called upon to put more into it. Moreover, the stock of well known company which is listed on one of the exchanges is acceptable at a bank as collateral for a loan while the stock of Al's company would not be accepted because there is no market for it. If Al wants to sell stock he can probably do so by making the price so attractive that some persons would buy as a speculation. But Ed should keep out of it.

C. J. MORRISON, *Consulting Engineer, Meyer, Morrison & Company.*

Larger Quarters

Al has not shown that his present quarters or equipment are really inadequate or that he has received actual orders for the improved article he is preparing to make. But from the confidence born of past success he has a hunch that he will again succeed. A depression of business in general should not be used as an excuse to discourage individual initiative and reasonable enterprise. Progress is made by taking chances consistent with experience. While ten per cent expansion may not be justified in many cases it may be well in others. Each case depends on its own circumstances. Moreover, if a business does not expand it is likely to contract.

—L. BROWN.

Another New Model

The position in which a customer finds himself, when he has just bought a new machine and then shortly discovers that there is a later and a better model, is an unfortunate one. Yet it is in a large measure unavoidable—one of the necessary industrial gambles. Any buyer owes it to himself to make a most careful survey of all the equipment in the field that might meet his needs before making his final decision.

Unless a manufacturer sells a piece of equipment with the understanding that it is his last model, I do not see where he is breaking faith with his customer. However, it is true that in some cases, machine builders coming out with a new line openly advertise the fact in advance, and offer such machines as they already have in stock at an attractive reduction in price, compensating for it to some extent, no doubt, by adding a little to the price of the later model. This is at least a worthwhile thing to consider.

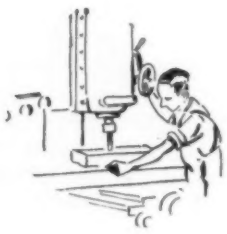
As to Al's doubt concerning whether the new model will be entirely satisfactory, it should certainly not be considered so until one or more of the machines has been built and actually proved itself in practice through a sufficient period of time. Above all, he should refrain from giving out any news or hints of a new model until he is absolutely sure he has one. That is nothing more than ordinary horse sense.

—JOHN E. HYLER.

What's in a Name?

To incorporate the name of the product in the title is not always a good policy. Many companies, organized for the purpose of manufacturing and merchandising a specific product, have in later years either dropped the manufacture of that product or added other products of equal merit.

A company organized to manufacture automobiles now successfully manufac-



tures and merchandises domestic clothes washing equipment.

In many cases, the company outlives the product—talking machines to radio receivers; gas mantles to refrigerators—and so on indefinitely. These are all cases of where enterprising individuals and companies carried on against adverse conditions and came through successfully.

Al and Mason would do well to let the name, Mason & Morton, engineers and machinists, suffice for the present, and as a sub-title add, Manufacturers of Rotary Compressors, giving their product such trade name as they may deem has advertising value.

—IRA S. WILLIAMS.

Let us assume that you are a superintendent in a small, growing manufacturing concern and that the amount of business on hand necessitates buying a milling machine. The instant you start investigating the possibilities of this tool, the question of who makes this class of equipment presents itself.

Naturally, you will secure names of manufacturers from trade journals, catalogs, from local machinery houses and finally from the recommendations of friends who have had experience with different designs. Now the real test begins; for now you call in machinery salesmen, and after several days of listening to sales talks, massing the most important specification details of each company's tool together with quotations on the bare machinery, supplemented with a myriad of prices on fixtures, chucks, tools and attachments, you finally sit down to analyze what it's all about. If at first you had visions that a name meant everything, by this time your disillusionment is complete, for all that matters now are facts, not names.

After much talk with the management as to amount of money that can be comfortably expended, you will boil the situation down to one or two designs. If the manufacturer has the tool that you are interested in, in some plant nearby, you may insist that a demonstration be given you so that you will have a more vivid conception of its possibilities. Finally you decide to buy one of the tools in question. Did you buy on the strength of having known the name for some time? No. You purchased what you thought was the best for the money, taking into consideration its suitability for your particular work.

—HAROLD L. WYNN, *Executive Engineer, Pacific Electric Manufacturing Corporation.*

Corporation or Partnership?

Corporations have taken the lead and distinction from the partnership and trusteeship forms of organization. The trusteeship is highly restricted and generally applies to real estate.

For large or small types of business, incorporation has proved to be the favorite for the following reasons:

1. Legal restrictions which require proper bookkeeping and records,

2. Elimination of risk for each stockholder beyond the amount of stock owned,

3. In a large majority of cases, it is easier to sell stock than an interest in a partnership,

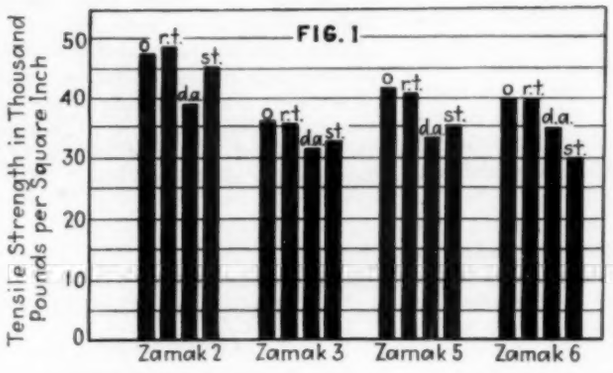
4. The corporation is more flexible in its organization.

The advantages of incorporating a small manufacturing business far offset the disadvantages. The cost of incorporating is relatively small compared to the advantages when the closed corporation is considered. The restrictions imposed by the various states act as watch dogs and require that the business be kept in order which is not always the case in partnerships. The stockholders annual meeting acts as a stimulant to the officers and directors, and they keep their house in order, whereas the tendency of the partnership is to go backward.

—C. F. STAPLES.

American Machinist
REFERENCE BOOK SHEET

Aging of Zinc Die-Casting Alloys



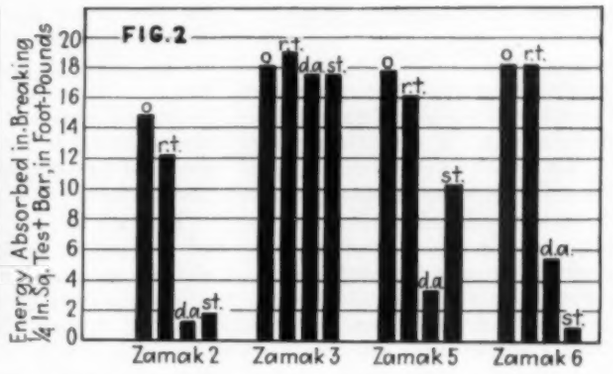


Fig. 1—Effect of aging treatments on the tensile strength of zinc die-casting alloys. Fig. 2—Effect of aging treatments on impact strength. Legend for chart: *o*—original strength; *r.t.*—after one year at room temperature; *d.a.*—after one year in dry air at 95 deg. C.; *st.*—after 10 days in steam at 95 deg. C. Note: Only average values for tensile strength and impact strength are shown on these charts

PHYSICAL characteristics such as tensile strength, impact strength and dimensional change must be known by the user of zinc die castings. Only recently has there been printed the information contained in the charts and table on the effect of aging on the above properties.

Aging changes of zinc alloys are usually negligible. In certain applications, however, close tolerances or delicate alignment require stability of dimensions. Zamak alloy No. 3 has the greatest dimensional stability and aging treatments have been worked out only for this alloy. Treatment is unnecessary after five weeks have elapsed since die-casting. Aging treatments are:

1. Heat to 70 deg. C. for 10 hours or to 85 deg. C. for 8½ hours or to 100 deg. C. for 6 hours. Follow treatment with furnace cooling to room temperature for 5 hours.

2. Heat to 70 deg. C. for 12 hours or to 85 deg. C. for 8½ hours or to 100 deg. C. for 6 hr. Air cool.

These treatments result in a negative change in dimensions in the order of 0.0005 in. per in. from the original size of the casting.

Effects of steam and dry-air annealing tests are shown in Figs. 1 and 2. Contrary to previous conceptions, it has been found that the steam test does not furnish an indication of the condition of the casting after a period of service. The dry-air annealing test approximately shows whether the aging changes are objectionable for a given use, but cannot be correlated with service exposure.

Total Expansion in Inches of 6-In. Test Bars

	10 Days 95°C. Steam	1 Year 95°C. Dry Air Anneal	1 Year Indoor Aging
Zamak 2			
Maximum...	.0130	.0229	.0013
Minimum....	.0106	.0194	—.0013
Average.....	.0118	.0212	.0000
Zamak 3			
Maximum...	.0044	.0019	.0000
Minimum....	.0034	.0006	—.0005
Average.....	.0039	.0011	—.0003
Zamak 4			
Maximum...	.0222	.....	.0170
Minimum....	.0192	.....	.0060
Average.....	.0207	.0263	.0121
Zamak 5			
Maximum...	.0022	.0057	—.0002
Minimum....	.0013	.0052	—.0004
Average.....	.0018	.0055	—.0003
Zamak 6			
Maximum...	.0098	.0113	.0002
Minimum....	.0059	.0080	—.0005
Average.....	.0079	.0094	—.0002

Courtesy of New Jersey Zinc Company

Original Properties of Die-Cast Zamak Alloys†

	Zamak 2	Zamak 3	Zamak 5	Zamak 6
Composition				
Aluminum	4.10	4.10	4.10	4.10
Copper	2.70	....	1.00	1.25
Magnesium	.03	.04	.03	...
Balance Horse Head "Special" (99.99+%) Zinc				
Tensile strength—lb./sq.in.	47,300	36,100	41,600	19,600
Impact strength (Charpy) as measured on ½x½ in. bar	15.00	18.25	17.75	18.50
Elongation—Per cent. in 2 in.	8.4	4.7	4.2	10.6
Compressive strength—lb./sq.in.	93,100	60,500	87,300	91,700
Brinell hardness	83	62	73	71
Specific gravity	6.754	6.644	6.675	6.717
Melting point	733.6°F.	727.9°F.	726.9°F.	731.8°F.
Solidification shrinkage—in./ft.	.1492	.1380	.1385	.1560
Modulus of rupture—lb./sq.in.	116,000	94,700	105,200	102,800
Transverse deflection—in.	.22	.27	.16	.27
Shearing strength—lb./sq.in.	45,800	30,900	38,400	38,000
Specific heat—calories/Gm./°C.	.1047	.0980	.1024	.1036
Thermal conductivity—cal./sec./cm.³/°C.	.253	.273	.256	.266
Thermal expansion—in./in./°C.	.0000277	.0000274	.0000274	.0000278
Electrical Conductivity—Mhos/cm.³ at 25°C.	144,402	155,302	150,532	151,111
*Relative fluidity in seconds	87-3/5	60-2/5	66-4/5	70
**Fluidity number	114	166	151	143

†These values are the average of several casts and were determined 6 months after casting date.
*Time required for equal volumes to flow through standard orifice at constant temperature.
**Derived by dividing 10,000 by time in seconds to indicate comparative fluidity.

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• IDEAS FROM PRACTICAL MEN

Improved Shearing Tools

ANDREW BEUSCH

We have a number of jobs in our press department, such as pipe clamps, brackets and other parts made from sheet steel. The blanks were previously cut off in ordinary shearing tools in the punch press, the blanks having the appearance of Fig. 1, where the sharp edges are diagonally opposed, and on some parts this was objectionable. In Fig. 2 is shown a piece where the sharp corners are on the same side (the radii on the rounded corners of both pieces is shown exaggerated). To produce the piece as in Fig. 2 in ordinary shearing tools, the stock must be turned over every time a piece is cut off. This is not only a tedious job, but it slows up production.

The tools illustrated in Fig. 3 overcome the undesirable features of this job, besides doubling production. The die-body *A* carries the die sections *B* and *C*. Section *B* is firmly attached to the body, while section *C* is adjustable. The sturdy screw *D* clamps section *C* against the spacer blocks *F*, which determine the length of one of the pieces to be cut off. The stock is fed along the guide strip *H* against the stop *I*, and at the down stroke of the ram two pieces are cut off. The stop can be set so that the two pieces are of different length, so that blanks for two different jobs can be produced at the same time. The punch is adjustable, the punch-holder having an extension *K* to which the two shear blocks *L* are bolted. Shims *M* are used to adjust the shear blocks to fit the die.

The two bolts *N* that hold the parts of the punch together are locked by slotted nuts that are tapered to fit countersunk washers, so that when the nuts are tightened they close in on the threads and lock. To sharpen the die, the sections are removed and are ground on the cutting faces, so that their height is preserved, and when the sections are too thin they can be replaced, so that the die really never wears out.

Forming Tools for 90-deg. Bends

ERNEST FOLDVARY
Budapest, Hungary

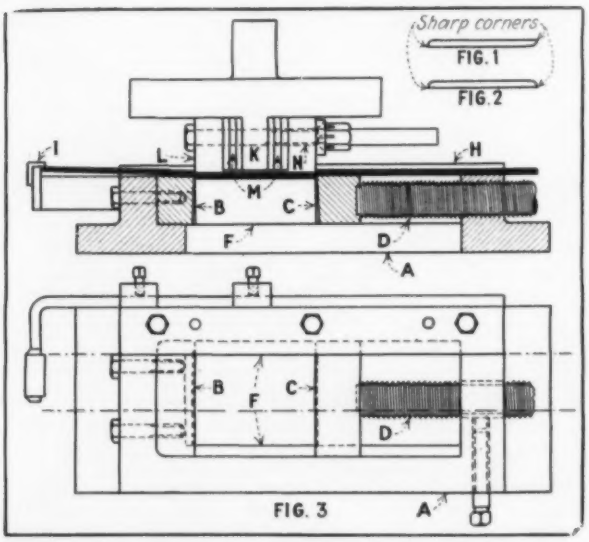
Producing accurate bends of 90 deg. in one operation is an extremely difficult task, due to the springback of the material. We had the problem of producing pieces similar to the one shown at *A* in the illustration, the legs of which must be accurately square with one another. After trying various methods, we found that the only solution for us was to make the tools as shown in the illustration.

In a bending die of conventional design we inserted the three blades *B*, which were shaped to produce the triangular ribs *C* on the inside of the bend. Naturally, the punch had slots to correspond with the blades. The ribs formed in the bends acted as stiffeners to prevent the metal from springing back. With these tools we were enabled to produce parts having accurately squared legs in one operation. Section *X-X* shows that the corner of the punch was made sharp at *D*, so as to squeeze the corner of the bend outside of and between the reinforcing ribs.

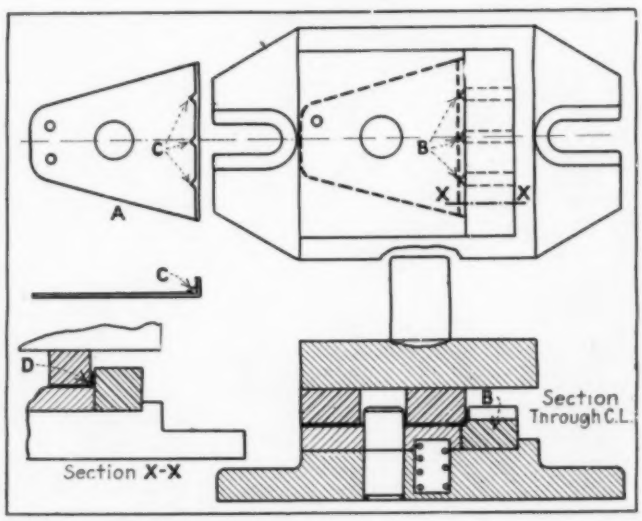
Lathe Attachment for Turning Irregular Shapes
Discussion

MATTHEW HARRIS

Referring to the article by Walter Wells under the title given above (*AM*—Vol. 76, page 1167), the attachment described is capable of turning out good work under the hands of a skilled workman. However, I would suggest that instead of scribing the contour line on the coppered surface of the plate *B*, it should be drawn on a piece of white cardboard in india ink, and that the cardboard be clamped to the plate. The plate could easily be provided with the necessary clamps and with guides to square up the cardboard. The black line on the white cardboard could be more easily seen and followed by the operator than could a scribed line on the coppered surface of the plate. Other advantages are that the time taken to



Adjustable punches and dies used in place of shear blades to secure uniformity in the edges of work



Small triangular ribs are used in the corner to prevent springback of metal in sharp bends. These are easily made by punches and dies shown

grind out the scribed line, preparatory for another job, would be saved; that a draftsman could draw the line on the cardboard more easily than it could be scribed on the plate; and that the cardboard could be filed away ready for use in case of a duplicate order.

However, the scheme is not new. A little more than forty years ago, I was in charge of a well-known plant making presses and press tools. We had an order for a lot of tools for making and ornamenting drawn shells to be used on lighting fixtures. Some of the shells were in the shape of bells, while others were acorn-shaped, and all were to have bands of ogees and other shapes around them. The shells were drawn by the usual method and were to be ornamented in a second operation.

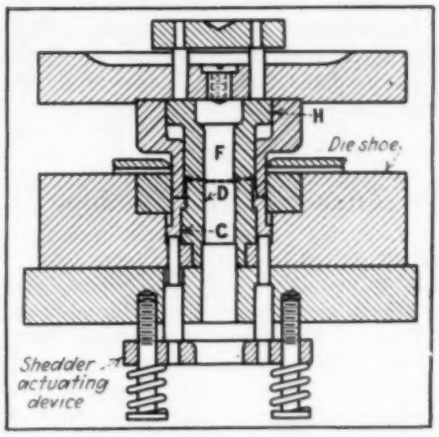
For turning the punches and boring the dies, we rigged up an attachment very similar to the one described by Mr. Wells, but instead of scribing the contour line on the plate, we had the die draftsman draw it in india ink on white cardboard, and the cardboard was clamped to the plate. The contour line on the cardboard was approximately of the same width as the thickness of the metal in the shells. In turning the punches, the tracer was made to follow the inner edge of the line, and in boring the dies it was made to follow the outer edge, thus allowing clearance for the metal in the shells. It was surprising how accurate were the tools made by this method and how little hand tooling was necessary to finish them so that they would pass rigid inspection.

Compound Press Tools

WM. C. BETZ
Master Mechanic,
Fafnir Bearing Company

The press tools illustrated blank, form, stamp and pierce steel caps, such as the one indicated by heavy dotted lines, in one operation. The material is 0.031-in. cold-rolled steel of No. 6 temper, and is lubricated by a pair of felt rolls running in an emulsion of French chalk, ammonia water and oil emulsion. The stock is fed by rolls and the press runs continuously at 150 strokes per minute.

In operation, as the ram descends, the disk is cut out by the blanking punch leaving it between the punch and the lower shedder *C*. Continued downward movement of the ram carries the blanking punch farther down, and the inner diameter of this hollow punch irons the cap over the horn *D*, which is also the piercing die. At the bottom of the downward stroke, the piercing punch *F* pierces a hole in the center of the cap, and the hollow punch *H*, which is also



Details of compound die for steel caps. Air jet blows work clear

the upper shedder, stamps the rib in the top.

As the ram ascends, the finished cap is carried up inside of the hollow blanking punch, from which it is ejected by a positive knockout. While the cap is falling from the punch, a blast of compressed air, timed by a cam valve of the Hennifin type, blows it clear of the tools. In stamping the rib, or bead, on the top of the cap, the stock is drawn away from the piercing punch, leaving the hole slightly larger than the diameter of the punch. For this reason the diameter of the piercing tools should be slightly smaller than the hole in the cap is intended to be.

Fixture for Milling Flats on Shafts

DUDLEY L. CURTIS

A bridge-type fixture for milling flats on opposite sides of short shafts in a duplex milling machine, using opposed cutters, is shown in the illustration. Unusual features of the fixture are the methods of locating and clamping the work.

Six shafts are inserted in openings at the top of the fixture and are located by their shoulders *A*. The parts of the shafts to be milled fit between the narrow V-blocks *B* and *C*, the inner ones of which are spread by means of the tapered ends of the clamping bolts *D*. The clamps *E* rest on the tops of two of the shafts, and when they are tightened the shafts are forced down into place. Continued screwing down on the clamping nuts draws up the bolts and causes their tapered ends to spread the inner V-blocks, clamping the shafts securely.

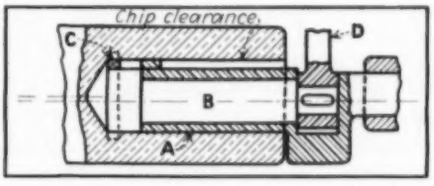
The fixture is narrow enough near the ends to permit the cutters to pass out of the way of the shafts to insure against any interference in loading and unloading. Pins *H* at the top of the fixture act as stops to prevent the clamps from being turned far enough around to interfere with loading and unloading. The clamping bolts are prevented from turning by the pins *I*. Hardened set-blocks *K* are provided for setting the cutters.

A Semi-Automatic Recessing Tool

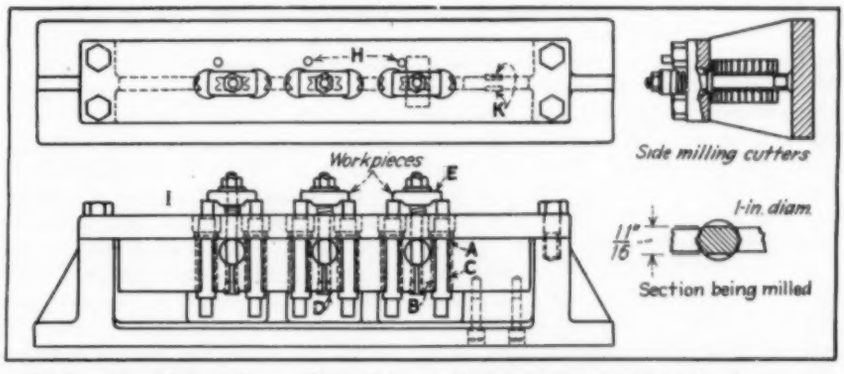
J. T. TOWLSON
London, England

In the illustration is shown a recessing tool of the semi-automatic type that is intended for use in screw machines and turret lathes.

The tool consists of the sleeve *A*, one end of which is entered into the hole in the work, the shank on the opposite end being held in the turret; the toolholder *B* fitting within the sleeve and having the cutter *C* brazed at the end,



Offset recessing tool for hand turret or semi-automatic lathes



Bridge type fixture for milling flats on six pieces of round stock at one operation. A single pair of side mills do the work

and a shank to which the operating lever *D* is keyed. The hole in the sleeve is eccentric with its shank. It will readily be seen that by rotating the toolholder 180 deg., by the operating lever, the eccentric action will cause the cutter to cut a recess to the depth that the cutter projects from the toolholder.

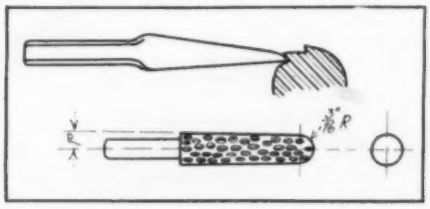
The recess may be made at any part of the hole, its position being controlled by the depth the toolholder is entered in the hole in the work. Also, the recess may be of any depth less than the maximum, the depth being controlled by the arc of rotation given to the toolholder by the operating lever. If the work is of such hard material that the leverage of the operating lever is not sufficient to cause the tool to cut with ease, worm gearing can be substituted for the lever. In that case, a segment of a wormwheel can be keyed to the shank of the toolholder.

Tool for Profiling Patterns of Wood or Soft Metal

F. E. FICK

The wooden or white-metal block from which the pattern is to be made is laid out to the required profile, heavy lines being scribed on its surface.

The profiling tool is turned in a lathe to the form desired, and then teeth are cut in it by a half-round chisel in the same manner that teeth are cut in hand-cut rasps. The size of the teeth should be varied to suit the material the tool



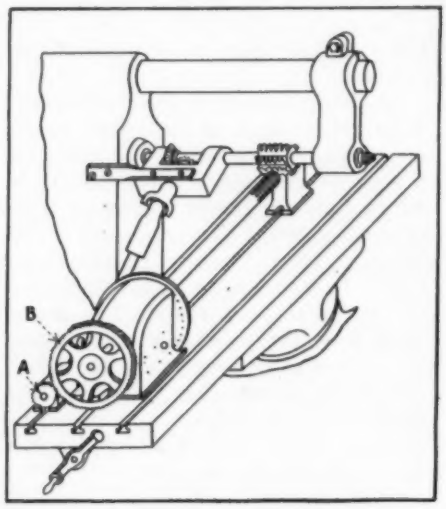
is to be used on. A temporary tool for soft wood need not be hardened, but, of course, a tool that is hardened will cut much better and will last longer.

To use the tool, hold it in a chuck in the drill press and run it at a fairly high speed; adjust the table of the machine to required height and place the block from which the pattern is to be made on the table. Press the block against the revolving tool and the tool will cut into the block and remove all surplus material much more quickly than it could be done by hammer and chisel. By guiding the block and holding it against the revolving tool, it is easy to work to the lines scribed on it. The sketch shows a tool of simple profile for forming a $\frac{3}{16}$-in. fillet and a 1-deg. draft, but of course, much more complicated shapes can be made. This type of tool is convenient in shops where all the different shapes of chisels are not available.

Attachment for Hobbing Splines

STEPHEN A. WETTY

Since the articles in the Ideas From Practical Men columns of the *AM* have been helpful to me for many years, I feel that I must pass along to the readers any ideas I may have. So here is an attachment I have developed for



Job-shop method of hobbing splines on a milling machine

a milling machine. It has proved to be valuable to our company and may be of value to others.

We manufacture replacement parts for automobiles, among which are stub shafts having multiple splines. These shafts are made in small lots and in sizes from 1 to 3 in. in diameter, the number of splines varying from six to ten. Since the lots are small and the time between orders is long, it was out of the question for us to buy a hobbing machine for the job, so we had the splining done by another concern, but the charges were terrifically high. Getting tired of paying such high prices for the work, I rigged up one of our universal milling machines for hobbing the splines, as shown in the illustration.

By means of miter gears, a yoke spanning the cutter arbor, and a telescopic shaft having universal joints, motion is transmitted from the spindle of the machine to the pinion *A*, the gear *B* and the spindle of the dividing head. The shaft on which the pinion *A* is keyed runs in a bearing mounted on the table of the machine. The gear *B* is keyed to the rear end of a long center held in the spindle of the dividing head. Of course, the indexing worm and its fittings were removed from the dividing head. Both the pinion *A* and the gear *B* can be removed and others having a different ratio substituted, according to the number of splines to be hobbed.

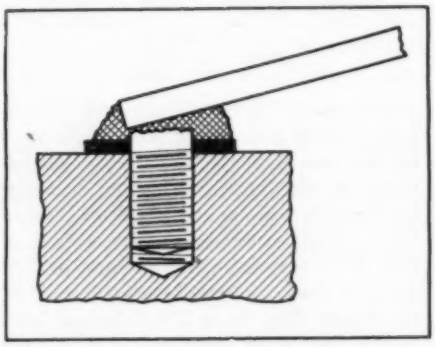
Due to the functioning of the telescopic shaft having the universal joints, the knee can be raised and lowered and the table can be fed lengthwise, crosswise or at an angle by the automatic feed. It will thus be seen that the table can be set to the angle called for by the hob, and can be fed at that angle while the spindle of the dividing head is revolving. The nice part about this hookup is that it can be used on any one of our universal milling machines that may be idle when an order for splined shafts is received.

Removing Broken Studs

FRED F. PINDAR
Proprietor, Pindar's Machine Shop

In order to remove a stud that was broken close to the casting into which it was screwed, I tried arc welding an extension to it so as to have something on which to grip for removing it. But the method was not a success because I could not prevent the electrode from touching the casting and welding the stud to it.

To get over the difficulty I placed a washer over the broken stud and welded it to the stud, the washer preventing the electrode from touching the casting. Then I laid a steel rod, strong enough to act as a wrench, on top of



Welding rod to broken stud to act as wrench in removing it

the broken stud and welded it to both the stud and the washer, as indicated in the sketch. The broken stud was then backed out of the casting, the whole process taking but a few minutes.

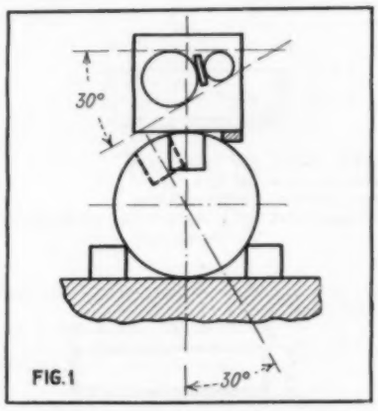
I have used this method many times and it has never failed me. While I have not tried it, there is no reason why broken taps cannot be removed by the same method.

Cutting Keyways at an Angle at Opposite Ends of a Shaft

HOMER COY
Studebaker Corporation

A 16-in. shaft was to have keyways cut at each end, the keyways to be at 30 deg. to each other. Since the shaft was so much longer than the table of the milling machine, it was necessary to support the outboard end, so a sturdy bench was placed in line with the table and the end of the shaft was blocked up to the correct level. At the inner end of the bench was placed a small surface plate that was shimmed up in line with the machine table, and a small angle plate was clamped to the shaft directly above the surface plate. To the angle plate were attached two hardened and ground disks separated by a distance piece to bring lines tangent to their edges to an included angle of 30 degrees.

The shaft was rotated until the lower edges of the disks were parallel with the surface plate, using a dial indicator. With the shaft clamped in this position a keyway was milled at one end. The shaft was then turned end for end and rotated until the upper edges of the disks were parallel with the surface plate, as shown in Fig. 1. In this position the second keyway was cut, being at an angle of 30 deg. with the first one. In Fig. 2 is shown a side view of the shaft with the bench, the surface plate and the angle plate in place during the cutting of the second keyway.



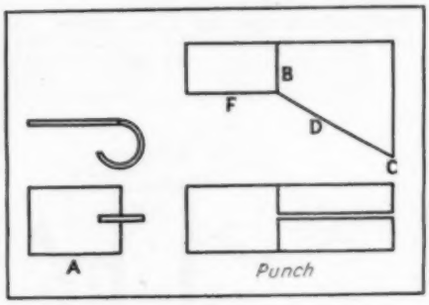
Detail of method used in securing correct angle between the two keyways

Utilizing Blanking Punches for Bending and Forming

CHARLES KUGLER

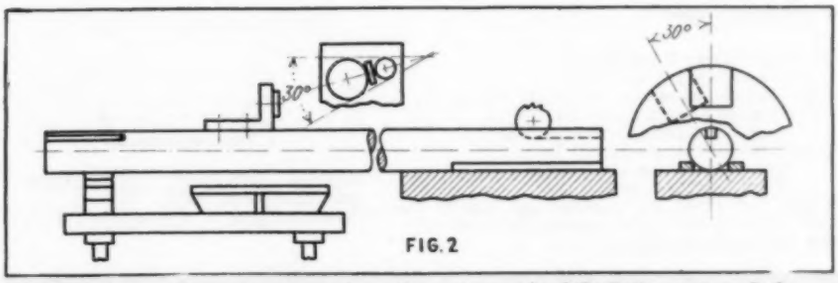
On reading the article by Charles F. Kraut, under the title given above (*AM*—Vol. 77, page 21), I was reminded of a case in which blanking and bending were done in the same set of tools and in one operation.

A sample of the work is shown at *A*, the stock being $\frac{1}{16}$-in. stamping steel. The long, slender tongue is curled, as



Bending and forming can easily be done by regular blanking punches

indicated, by the punch *B* at one stroke of the press. The part *C* of the punch contacts with the metal first and cuts the long, slender tongue by a shaving action, at the same time curling it, due to the angular part *D* of the punch. On further descent of the ram, the part *F* of the punch completes the blanking. The angle of the shearing and curling part of the punch must be determined by experiment.



How the work was supported at the outer end while being cut and the application of the angle gage to the work

SEEN AND HEARD

JOHN R. GODFREY

Absorbing or Confining Noises

We are learning that noise can be overcome by proper methods of absorbing it, even if we cannot altogether prevent the vibrations that cause it. Sheets of soundproofing material suspended between machines for detecting gear noises go far in shutting out the sounds from adjoining machines. Felt lined boxes put over motors practically eliminate the motor noise itself. One gear machine man has reversed this process by enclosing the gears being tested in a hood which terminates in a small opening about the size of the ear. The hood confines the noise to such an extent that a set of gears we would normally call perfect, is far from quiet when heard in this box. The tester has to accustom his ear to the new conditions, and it may be compared to using a "tenth" micrometer where one formerly used a vernier.

What Color Walls?

Light plays a far more important part in manufacture than in the past. It is a far cry from the open gas jet over each machine to the general lighting by overhead lamps, supplemented where necessary by properly shaded individual lights. And yet the illumination itself isn't all there is to it. The wall covering and the color of the machine and other equipment plays its part. White and the lighter shades of yellow and gray have all been tried. According to tests for the N. J. Zinc Co., light reflection is in this order: white, yellow, green and gray. This affects not only the money you pay the electric light company but also the quality of the work done.

Speeds for Drawing Metals

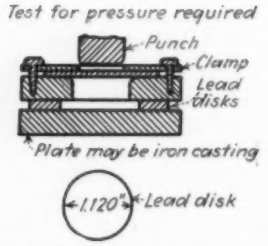
Every little while someone brings up the question of speed in working metals. The old theory of allowing time for the metal to flow seems to be pretty well exploded. Copper wire is now drawn at from 2,500 to 3,000 ft. per min. and cold drawn steel rod at 250 ft. Yet so far we rarely exceed 70 ft. per min. in sheet metal drawing operations. We must, however, consider the great difference between continuous and intermittent work, especially as it is affected by the problem of handling the work. There is little use in doubling the speed of the press in cases where the actual time of drawing is but a small fraction of that required for the complete cycle of operations.

Preventing Scratches on Motors

While a few scratches in the lacquer finish of a motor do not affect its operation in the least, the customer is apt to feel that he hasn't quite had his money's worth. One motor maker has found that by putting sheets of plain Cellophane between the motors when stacking them before shipment there was no scratching, transfer of lettering, or fuzz of any kind to mar the appearance.

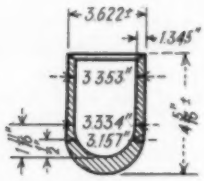
Press Work Pressures

Series II — *Drawing*

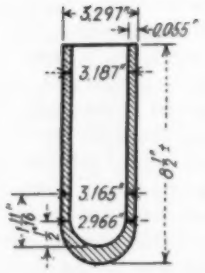


To obtain by experiment the pressure required to produce drawn work. Place several disks between plates as above. Trip press. Remove disks and compare reduction in thickness with table below. Find corresponding pressure per disk from table. Multiply by number of disks to find total pressure

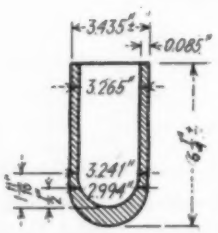
Tons Pressure	Original Thickness	Thickness After Test	Amount Compressed
1	0.247 in.	0.235 in.	0.012 in.
1½	0.245	0.210	0.035
2	0.256	0.195	0.055
3	0.246	0.162	0.084
4	0.245	0.140	0.105
5	0.246	0.118	0.128
6	0.247	0.106	0.141
7	0.243	0.095	0.148
8	0.249	0.094	0.155
9	0.249	0.091	0.158
10	0.245	0.085	0.160



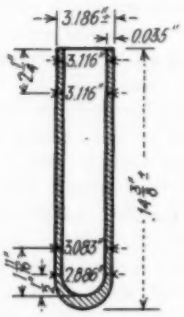
Operation--Draw cartridge case
Press--100-ton capacity, 15-in. stroke
Reduction in thickness--Not more than 30 to 34 per cent on each draw



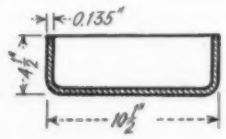
Operation--Draw cartridge case
Press--100-ton capacity
Reduction in thickness--Not more than 30 to 34 per cent on each draw



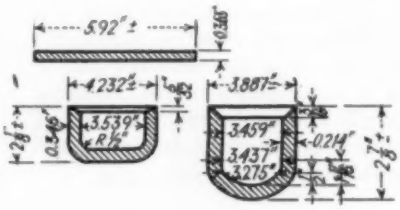
Operation--Draw cartridge case
Press--100-ton capacity, 20-in. stroke
Reduction in thickness--Not more than 30 to 34 per cent on each draw



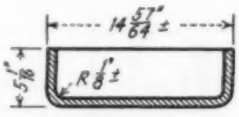
Operation--Draw cartridge case
Press--100-ton capacity
Reduction in thickness--Not more than 30 to 34 per cent on each draw



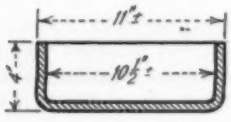
Material--Sheet steel
Operation--Draw cup
Press--500-ton toggle, 250-ton pressure on plunger



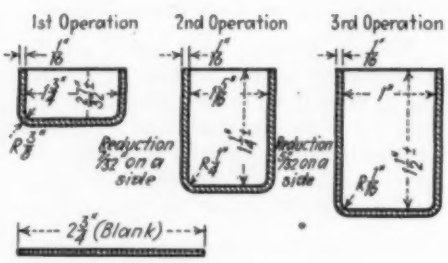
Operation--Draw cartridge case
Press--100-ton capacity, 10-in. stroke
Reduction in thickness--Not more than 30 to 34 per cent on each draw

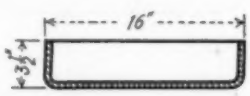


Material--Steel for brake drum
Operation--Draw red hot
Press--500-ton, double-action
Shrinkage about 7/64 in. per in. of diameter

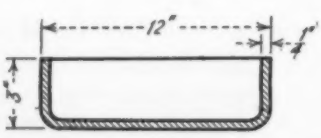


Material--Steel blank, 16 1/2 in. in diameter by 1/4 in. thick
Operation--Blank and draw drum cold
Press--500-ton, double-action; shear on blanking die, 3/4 in.; pressure on plunger, 250 tons.



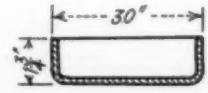


Material--Steel
Operation--Draw cold
Press--500-ton, double-action



Material--Steel blank, 1/4 in. thic.
Operation--Draw cold
Press--500-ton, double-action

Material--Steel blank, 2 3/4 in. in diameter by 1/6 in. thick
Operations--Cupped and redrawn in single-action presses, and in dies similar to regular cartridge drawing dies
Pressures--First operation--10,800 lb.
Second operation--12,600 lb.
Third operation--9,200 lb.
For articles four times the thickness and size of the the above, multiply by 16 the pressure required here
Test made on testing machine



Material--Soft steel, 7/64 in. thick
Operation--Draw shell
Press--200-ton, single-action

Contributed by C. W. LUCAS

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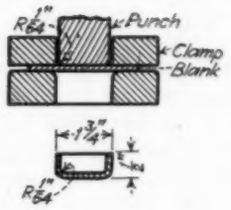
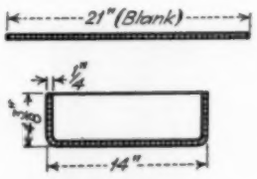
Press Work Pressures

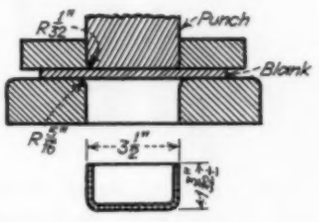
Series II—*Drawing*



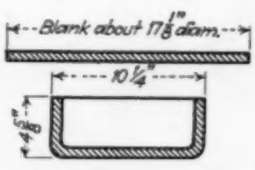
Material--Steel blank, 2 5/8 in. in diameter by 0.023 in. thick
Operation--Draw cup
Pressure--4,200 lb. to draw cup
75 lb. to strip from punch
Test made on testing machine



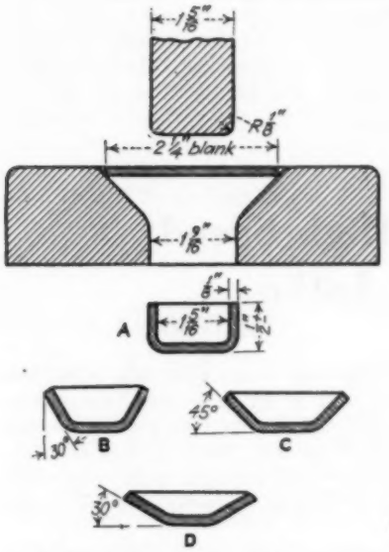
Material--Steel blank, 21 in. in diameter by 1/4 in. thick
Operation--Draw cold
Press--1,000-ton, double-toggle
Production--50 per hour



Material--Galvanized steel blank, 5 1/4 in. in diameter by 0.046 in. thick
Pressure--16,600 lb. to draw
1,600 lb. to strip from punch
Test made on testing machine

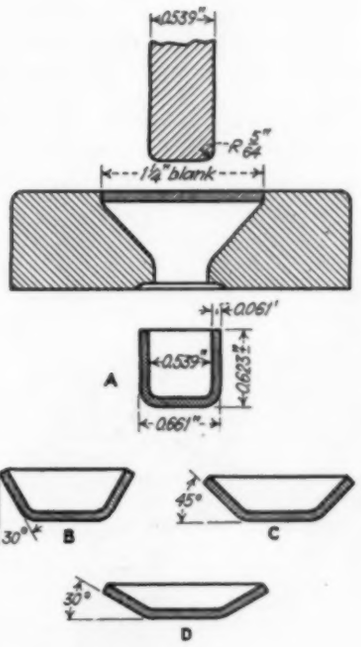


Material--Soft steel blank, 17 1/8 in. in diameter by 0.132 in. thick
Operation--Cold draw shell for motor case
Press--500-ton, double-action

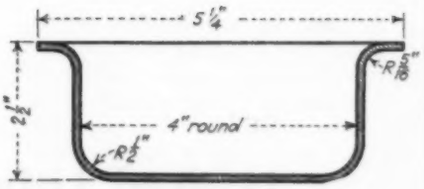


Material--Brass, 1/8 in. thick
Steel, 1/8 in. thick
Operations--Form as shown at A, B, C, C

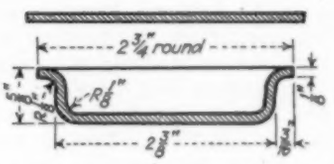
Pressures --	Brass	Steel
A.	9,500 lb.	14,000 lb.
B.	4,600	7,000
C.	3,400	6,000
D.	2,000	3,700



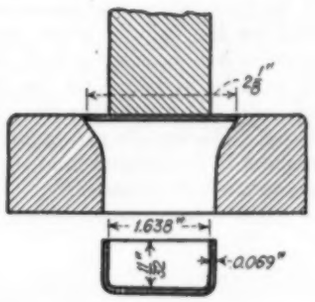
Material--Steel, 0.061 in. thick
Operations--Form as shown at A, B, C, D
Pressures--A. 4,500 lb. B. 3,400 lb.
C. 1,800 lb. D. 1,100 lb.



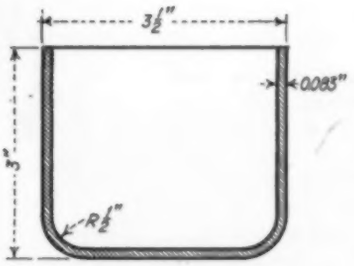
Material--Steel blank, 7 3/4 in. in diameter by 5/64 in. thick
Operation--Draw in one operation
Press--100-ton, single-action, with spring drawing attachment



Material--Machine steel blank, 1/8 in. thick by 3 in. in diameter
Operation--Draw cup hot
Press--50-ton capacity



Material--Annealed copper
Operation--Form cup
Pressure--6,000 lb.



Material--Soft steel, 0.083 in thick
Operation--Form in spring drawing dies
Press--70-ton capacity

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SHOP EQUIPMENT NEWS

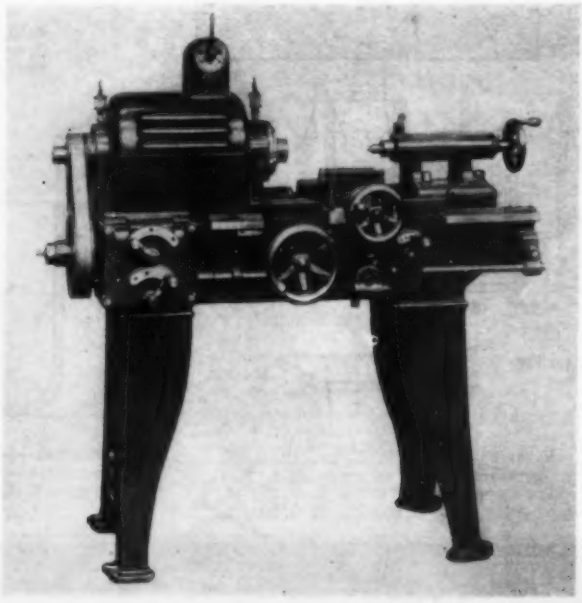
LeBlond 11-In. High Speed Production Lathe

Application of the motor-armature-on-spindle principle to a high-speed lathe by the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, has resulted in a lathe that can be brought up to 3,600 r.p.m. and stopped five times per minute. The lathe is intended for precision work and is suitable for turning small shafts and also for materials such as bronze, babbitt, Bakelite, aluminum and white metal. Strength is embodied to resist the strains of frequent starting and stopping at high speeds and the resultant shock from excessive tool impact.

The multi-speed motor armature is mounted on the spindle which rotates on precision ball bearings. End thrust of the spindle is taken on the front bearing and the rear bearing floats lengthwise. The spindle can be brought to top speed in two seconds and stopped in one and one-half seconds.

The bed is of heavy construction. The rear carriage bearing is flat, while the front way is an improved "compensating V" design that resists tool pressure in all directions. Both the bed and carriage are high-strength nickel-iron castings of fine-grain, wear-resisting structure.

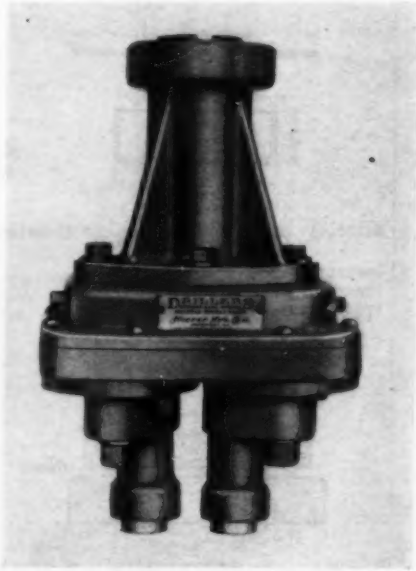
One-piece box-section construction is employed for the apron, in which all of the bearing brackets are cast integral. All shafts and studs are supported on both ends to insure alignment of the gears. Both cross and length feeds are controlled by a single positive-feed clutch. An automatic length stop can be furnished with this apron to stop the carriage within two or three thousandths, thus making it possible to turn to a shoulder without using hand feed. The feed box provides for nine feed changes, readily obtained by the use of two levers. Feeds are arranged in approximate geometric progression.



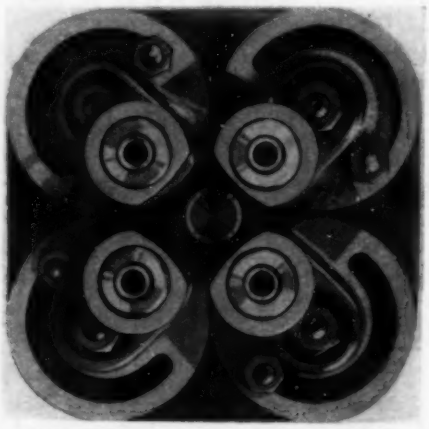
Rapid starting and stopping and a top speed of 3,600 r. p. m. make this LeBlond Production Lathe suitable for turning small shafts and non-ferrous parts with tungsten- and tantalum-carbide tools

Hoefer Solid Adjustable Drillhead

The Hoefer Manufacturing Co., Freeport, Ill., has developed a line of solid-adjustable drillheads that will handle all types of drilling operations where the holes are arranged in circles. The entire mechanism is incased in a closed oil-tight body. Various types of adaptors can be provided to fit any type of drive, whether it be for a drilling, milling, boring or other machine. This adaptor is braced to the main top of the head to give stiffness under thrust. The body is made in two parts—top and bottom. The bottom is finished on the lower face so that the swinging brackets will always carry their spindles in planes parallel to one another, thus avoiding excessive drill bushing wear and non-parallel holes in the work. This finished surface also carries thrust from the



Hoefer Solid-Adjustable Drillhead for drilling holes in a range of bolt circles



Underside of drillhead, showing clamping means for holding spindles at various distances from center

swinging spindle brackets directly to the head adapter, so that the spindles are maintained parallel.

Inside the housing is carried the main drive shaft with its drive gear cut integral. From this main gear, power is delivered to as many idlers as there are spindles in the head. Each spindle has its own idler, permitting wholly independent adjustment of each spindle. The lower ends of these idlers enter the spindle bracket, which is fitted snugly to the bottom of the head. The idler gear centers are equally spaced around the circle, according to the number of spindles. From these individual idlers power is taken by the spindles which are located in the offset of the bracket. The bracket pivots around the idler to give adjustment between the center of the spindle and center of drill head, and thus increase or decrease the radius of the circle in which the holes are drilled. A double means of clamping is afforded, one through the idler gear and the other by means of a stud and nut clamping on both edges of a finished ring—on the bottom of the drillhead.

This Type B drillhead is made with spindles from two to eight as standard, and more as special. It is provided with either plain bronze bushed bearings, and ball thrusts to the spindles, or full anti-friction equipment.

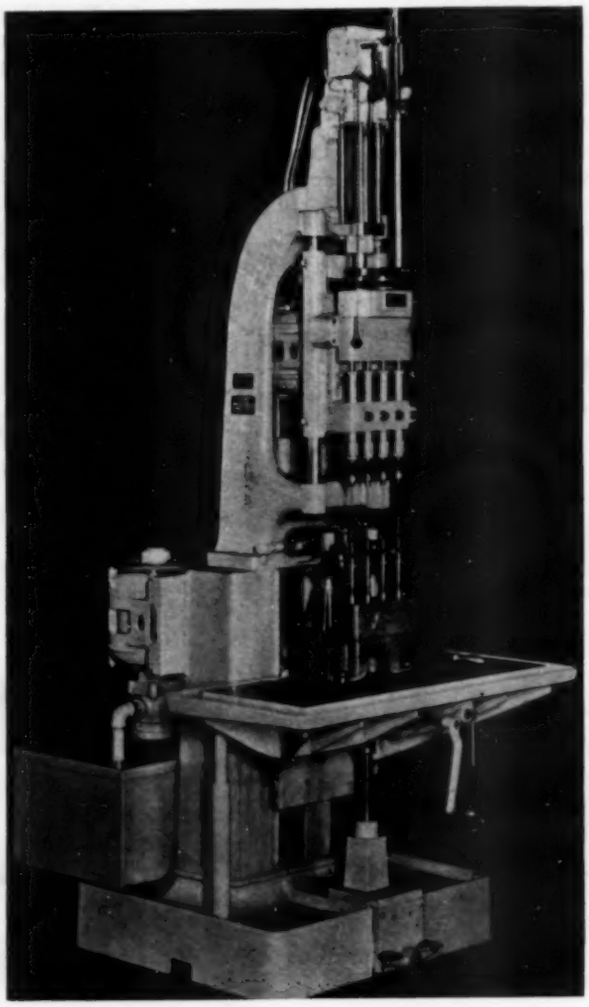
Allen Step Drilling Machine with Hydraulic Feed

Deep drilling of small holes is the function of the step-drilling machine announced by the Chas. G. Allen Co., Barre, Mass. Each drilling unit has a maximum capacity of four ¼-in. holes, 8 in. deep, and two or more units can be mounted on one base. In operation, the drills are advanced at high speed to the work, then automatically changed to fine feed, and after drilling a predetermined depth of step, they are completely withdrawn from the work and returned at high speed to the point previously drilled, after which they go into the fine feed again. When the holes are drilled to the full depth, the slide returns to its highest position and stays there while the operator is reloading the fixture. The cycle is started again by pulling the pendant ball handle.

The spindle slide carries four full ball-bearing spindles having independent vertical adjustment and equipped with ⅜-in. chucks. The number and spacing of the spindles can be varied to suit requirements, and the machine can be furnished with any spindle speed from 750 to 3,000 r.p.m. The spindle driving motor is mounted directly on the spindle slide with convenient means for adjusting the tension of the V-type driving belt. Feed per revolution of the drill and the depth of step are readily adjustable. The spindle slide travels on hardened guide bars with standard interchangeable hardened bushings at each corner of the slide. It is provided with means for lubrication. Any lost motion between the ram of the hydraulic feed cylinder and the slide is prevented by fastening them together.

Adjustment of the work table is secured by a telescopic screw. This adjustment, in conjunction with the adjustable stroke of the slide and the vertical adjustment to the drill spindles, makes the equipment easy to set up for different jobs. A treadle at the front of the base starts and stops all motors.

Specifications: Maximum stroke of spindle slide, 9 in.; independent vertical adjustment to spindles, 2½ in.; vertical movement of table on column, 15¾ in.; maximum distance—chuck to table, 28 in.; floor space of machine with one unit, 42x49 in., and height overall, 7 ft. 10 in.



Four spindles with ⅜-in. chucks are provided per unit for the Allen Step-Drilling Machine. Feed is obtained hydraulically

Westinghouse Self-Protecting Capacitor Motor

Equipped with a small disk-type thermostat, a line of resilient-mounted, single-phase capacitor motors, which protect themselves from burning out regardless of service conditions, has

been placed on the market by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. Mounted on the motor frame, the thermostat opens the supply current when the motor temperature approaches a dangerous value, and automatically re-starts the motor as soon as it cools down. The motor remains on the line until the temperature approaches the danger zone. Furthermore, it is silent.

The thermostat consists of a small bimetallic disk. The contact opens so fast that arcing is practically eliminated. The base is of pressed steel and is attached by springs extending to the bottom of the oil reservoir. Under each spring there is a snubber.

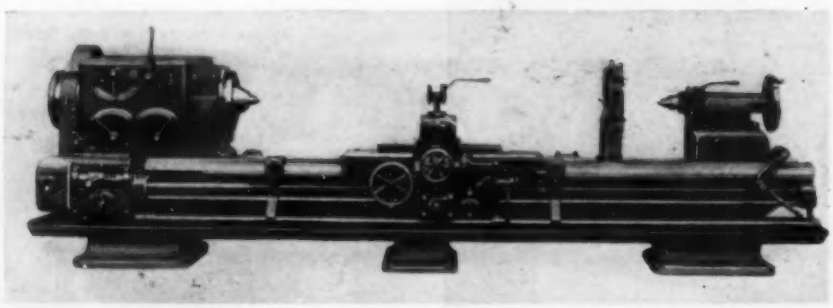
LeBlond Heavy-Duty Oil Country Lathe

A heavy-duty lathe for the fabricator of equipment for oil drilling and for the oil-field maintenance shops has been developed by The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. The spindle has a bore of 10¼ in., and runs in large bronze, babbitt-lined bearings. The twelve-speed headstock has spindle reverse, selective speed change, continuous forced circulation of filtered oil, and all intermediate shafts mounted on anti-friction bearings. All of the sliding gears are mounted on splined shafts, and no jaw-type positive clutches are employed. Final drive to the spindle is through helical gears.

An exceptionally wide range of feeds gives all of the leads commonly required without the use of pick-off gears. Double-wall box-type construction is employed for the apron. All shafts are supported on both ends to insure rigidity. A positive clutch engages the feed and permits the operator to disengage the clutch under the heaviest cut without fear of the carriage dragging past the desired position.

The taper attachment is constructed for heavy work. Cast integral with the carriage is the frame that supports the slide. The taper bar is mounted on a rigid swivel slide and may be accurately adjusted by means of a screw. Capacity of the attachment is 6½ in. per ft. for 18 in., or 4¾ in. per ft. for 30 in. Cross-slide is actuated by both the cross feed screw and a connecting link. An adjustment on the cross feed screw nut eliminates backlash.

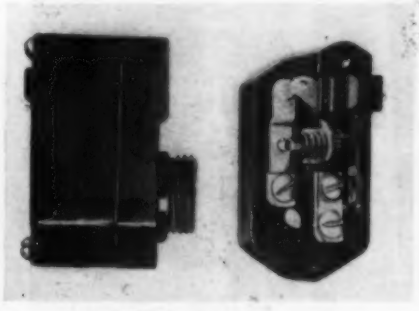
Power traverse to the carriage facilitates rapid traverse and reduces labor when long shafts are being turned. The traverse disengages automatically if an obstruction is encountered. The bed is a nickel-alloy, semi-steel casting.



For oil-country use, this LeBlond Lathe has a 12-speed headstock and provides all leads required without employment of pick-off gears

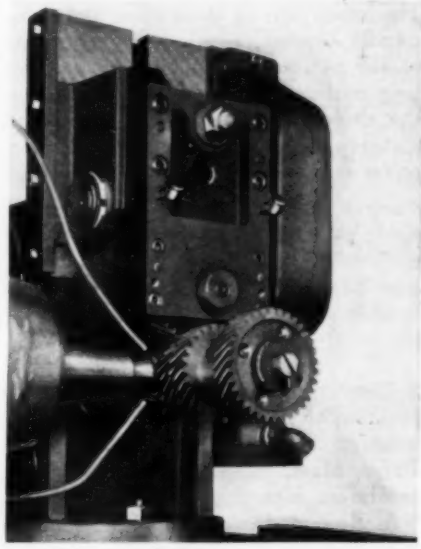
Square D Overload Breaker for Fractional-Hp. Motors

For the overload protection of fractional-horsepower, single-phase motors, the Square D Co., Industrial Controller Division, Milwaukee, Wis., offers the new "Knockout" overload breaker. This breaker, designated as Class 9020, Type W10, is designed to mount on and wire into a standard ½ in. knockout. Overall dimensions of the Bakelite case are 2⅞ in. high, 1⅜ in. wide and 1¾ in. deep. The breaker is of the thermal, melting alloy type. After an overload trips the breaker, it is reset from an indicating button. No replacement parts are required. Contacts are silver-to-silver, single pole, double break. Maximum rating is ¾ hp., 110 or 220 volts, a.c.



Spiral Gear Workhead for Peerless Gear Chamfering Machine

The City Machine & Tool Works, Dayton, Ohio, has announced an improvement to its standard workhead which permits the chamfering of spiral

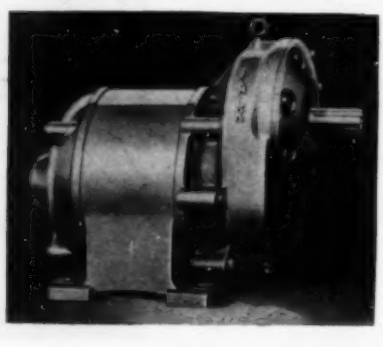


Close-up of improved workhead for Peerless gear tooth chamfering machine, showing the tool in the cutting position for chamfering the teeth on a helical gear

or helical gears rapidly. Developed particularly for helical gears, this workhead is equally adaptable to spur gears, and with slight changes can be applied to all No. 3 Peerless machines. The head can be quickly readjusted to meet various diameter gears. It has an anti-friction bearing idler drive.

Falk Geared-Head Motoreducer

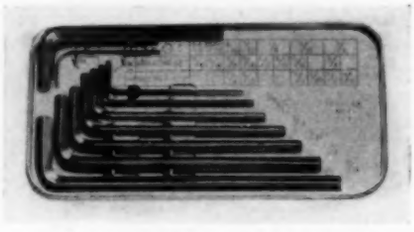
A geared-head "Motoreducer" has been developed by the Falk Corporation, Milwaukee, Wis. The design makes possible the use of high-speed motors instead of the more costly low-



speed type, and provides any desired speed from one-ninth motor speed to about two and one-half times the motor speed. Variation is secured with a simple single-pair gear train. The standard NEMA horizontal ball bearing motor is used without change, except for omission of one end bell and the use of a special shaft which carries the driving pinion. The geared-head type differs from the other three types of Motoreducers in that the motor frame supports the gearing, the gear housing being rigidly connected to and supported from the stator. The take-off shaft is generally located directly above and in line with the center of the motor, but the design is such that it can be positioned to either side or below. The geared-head motors are built in sizes up to 15 hp.

Celco "Hex-O-Wrench" Tool Boxes

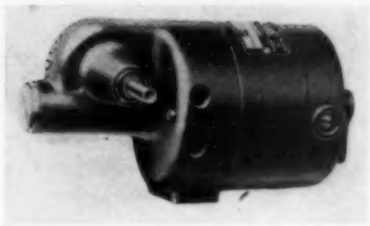
For the purpose of keeping hex wrenches in orderly fashion, the C. E. Little Manufacturing Co., 28 Newberne St., Somerville, Mass., developed a line of "Hex-O-Wrench" tool boxes with each wrench position stamped plainly in



the box. One place is provided for each wrench. The tool box will take either short or long arm wrenches, and both the cover and the box are plated. The company is also offering several sets of wrenches with boxes, particularly sizes of hex wrenches that are somewhat difficult to obtain.

Dumore Universal Motors

Three universal motors have been placed on the market by the Dumore Co., Racine, Wis. Type K-3 is a series universal motor designed for applications where better than average performance is required. Ratings are as follows: 30 min. rating at 5,500 r.p.m.—$\frac{1}{4}$ hp.; continuous duty at 6,500 r.p.m.—$\frac{1}{8}$ hp. The J-3 is the same as K-3 except in design of mounting and ventilation. Both motors are designed to operate electrical tools such as portable drills, saws, routers, grooving machines, and sanders.

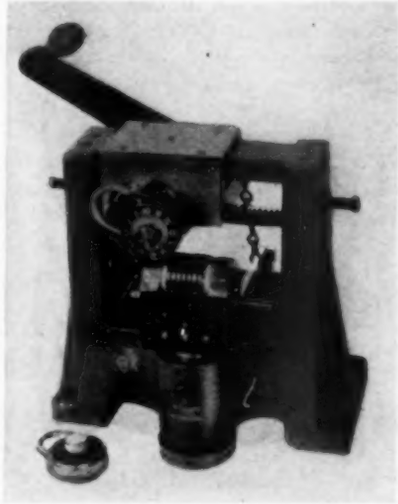


Dumore Type EEXQ Universal Motor with single worm gear reduction

The Type EEXQ motor is a small, inexpensive slow-speed universal motor but has dynamic balance. A single worm-gear reduction forms an integral part. Full-load speed is 8,000 r.p.m. Gear ratios are 15:1, 30:1, and 40:1 as standard. Shaft speeds are 200 to 750 r.p.m.

Noble & Westbrook Bench-Type Marking Machine

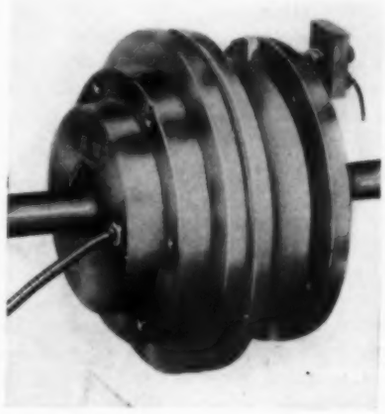
The Noble & Westbrook Manufacturing Co., 20 Westbrook St., East Hartford, Conn., has developed a hand-operated, bench-type marking machine especially for marking serial numbers on locks and similar articles. The machine has a number of features somewhat different from those formerly incorporated in machines of this type.



The device for holding the lock is connected directly with the handle of the machine. This not only operates the lock in a forward direction, but holds the lock in the correct position. By turning the handle, the lock is carried over the numbering head through means of a small rack and gear. The automatic numbering head is placed below the article, to enable the operator to keep a close check on the series of numbers being marked. During the return stroke of the handle, the wheels in the numbering head are automatically advanced to the next highest number. Adjustment is made for raising the numbering head to produce the desired depth of marking.

Stearns Combination Clutch and Brake Unit

The Magnetic Manufacturing Co., Milwaukee, Wis., has developed a combination magnetic clutch and brake unit that has been used in certain machine tools. Its dual purpose is to provide for clutch and brake action for motor-driven spindles. The magnetic clutch



is 10 in. in diameter and has a torque rating of 1,000 in.-lb. It is mounted inside the driven sheave which idles on the shaft. The magnetic brake is 8 in. in diameter, with a torque rating of 850 in.-lb. It is mounted in a fixed position in the housing of the spindle gearbox. The armature is slideably keyed to the shaft, and is used for both clutching and braking. To conserve space the collector rings are mounted within the sheave.

"Centerlock" Drill Bushings, Locating Pins and Rest Buttons

Interchangeable, standardized drill bushings, locating pins, rest buttons and their retainers have been placed on the market by the Centerlock Drill Bushing Co., 12125 Cardoni Ave., Detroit, Mich. These products are said to embody precision accuracy relative to radial alignment of renewable bushings or locators, particularly in respect to their location in coinciding liners or retainers. This condition was achieved by the adoption

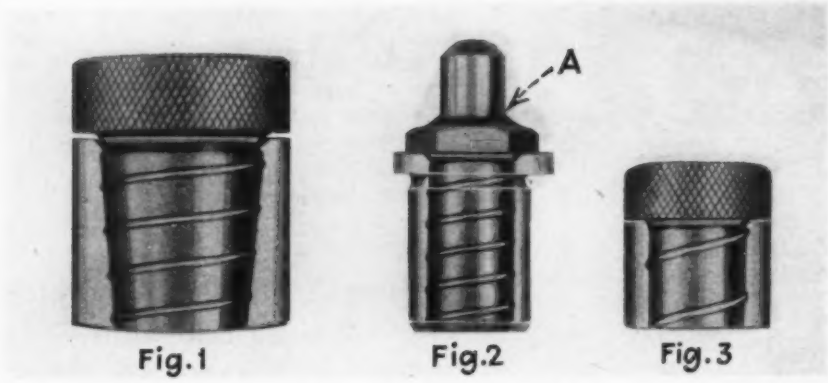


Fig. 1—"Centerlock" Special Precision Drill Bushing. Fig. 2—Locating Pin. Rest Button is same construction except for pin *A*. Fig. 3—Standard Drill Bushing with knurled head

on an encircling means around the actual bearing between the bushings or locators and their liners or retainers. The spiral grooves provide means for insertion of a common spring. While normally made of tough wire, the spring can be made of soft material to provide a safety shear feature.

The standard interchangeable drill bushings are manufactured with a groove having a non-lock helix angle, which provides for a free-lock condition. Standard locating pins, rest buttons and their retainers are manufactured with a groove having a locking helix angle that provides a fixed condition when assembled in place with a wrench upon the hex formed head provided for that purpose. Standard drill bushings can be made to provide for closer drill centers as it is unnecessary to maintain any particular diameter of head.

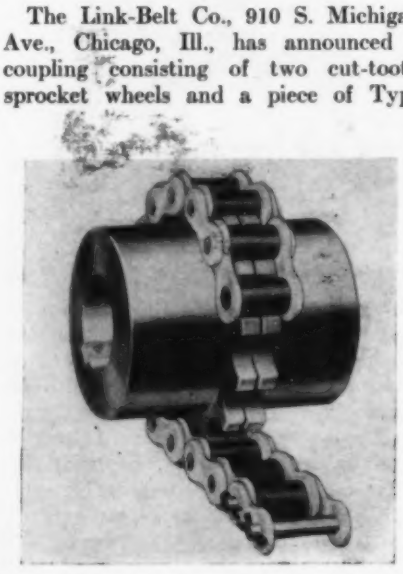
The accompanying illustration shows a special precision bushing Fig. 1, which is only made to customers' special requirements. Due to its tapered bearing seat, this precision bushing does not permit any radial misalignment that is possible with standard bushings which require 0.0002 to 0.0005 in. fit allowance.

Van Keuren Rectangular Gage Blocks

Because of need for frequent and economical replacement of worn gage block standards, a complete 81 block series of rectangular precision gage blocks from 0.050 to 4.000 in. is now being offered by The Van Keuren Co., 12 Copeland St., Watertown, Boston, Mass. The gages are of alloy steel, approximately $\frac{3}{8}$ by $1\frac{1}{4}$ in., and $\frac{3}{8}$ by $1\frac{3}{8}$ in., and with mirror-like surfaces optically flat and parallel so as to combine readily by wringing together. They are held within a tolerance of 8 millionths of an inch and are guaranteed as reliable standards of length at 68 deg. F. The blocks are also available as individual gages in a 33-block, ten-thousandth combination set for departmental or small shop requirements.

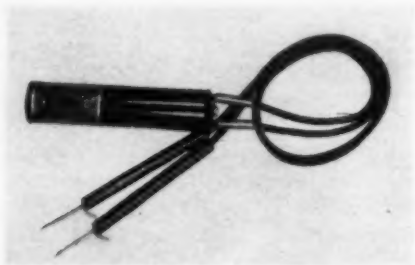
Link-Belt "RC" Flexible Coupling

The Link-Belt Co., 910 S. Michigan Ave., Chicago, Ill., has announced a coupling consisting of two cut-tooth sprocket wheels and a piece of Type "RC" Silverlink roller chain (*AM*—Vol. 76, p. 207). All working surfaces are machined to close tolerances. A pin-and-cotter link makes it easy to couple or remove the chain. The coupling can be inclosed in either a stationary or revolving, automatically-lubricated, oil-retaining casing.



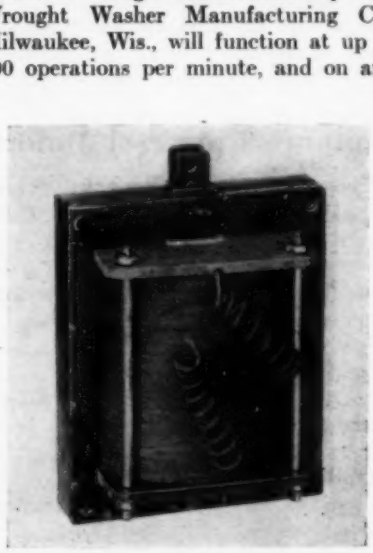
Square D Voltage Tester

No lamps are required in the voltage tester developed by the Switch & Panel Division, Square D Co., Detroit, Mich. The tester registers accurately the voltage as well as indicating whether it is a.c. or d.c. All that is necessary is to place one wire in each side of the circuit and the indicator shows what the voltage is. A.c. voltage is shown by the slight vibration of the indicator. Fibre handles insulate the lead wires. Because of its size, the tester may be carried in the pocket.



"Trombetta" Solenoids

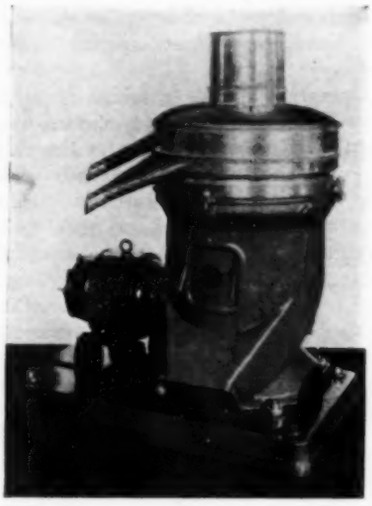
Solenoids can often be substituted for complicated mechanisms, particularly if the rate of operation is high enough. The line of "Trombetta" solenoids being maufactured by the Wrought Washer Manufacturing Co., Milwaukee, Wis., will function at up to 200 operations per minute, and on any



frequency of alternating current. They will also operate on d.c. current. Voltages are up to 2,300. From these solenoids a force of 10 to 20 lb. may be secured, to act through a distance of 1 to 4 in.

Sharples "Rotojector" Centrifugal

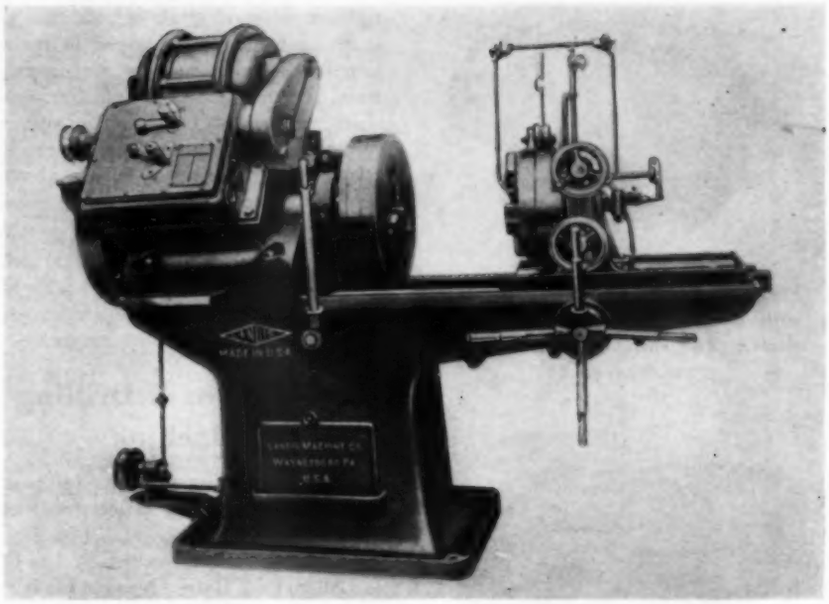
A quick bowl-cleaning feature adapts the "Rotojector" centrifugal, made by the Sharples Specialty Co., 23rd & Westmoreland Sts., Philadelphia, Pa., to a new field for clarification and separation problems. Because of its quick bowl-cleaning feature it is of value in the separation of fine metal chips from cutting



compounds, particularly where the amount of solid dirt is excessive. The "Rotojector" will operate continuously on liquids containing a relatively high percentage of solid materials. It combines high centrifugal force with the ability to discharge its solids or bowl cake while running at full speed. This feature eliminates the labor heretofore required for bowl cleaning.

Eight-Speed Gearbox for Landis Threading Machines

The Landis Machine Co., Inc., Waynesboro, Pa., has developed an eight-speed selective-type gearbox for use on its 2 in. pipe threading and cutting machine, 2 in. pipe and nipple threading machine, and 2 and 2½-in. bolt threading machines. Heretofore, these machines, when arranged for motor drive, employed a tumbler-type gearbox giving five speeds. But it has been found that because of the wide variation in machineability of materials used in pipe and bolts a wider speed range is essential to insure efficient operation of the machine on all diameters of work. The gearbox gives not only slower speeds than those heretofore considered standard, but also a number of faster speeds.



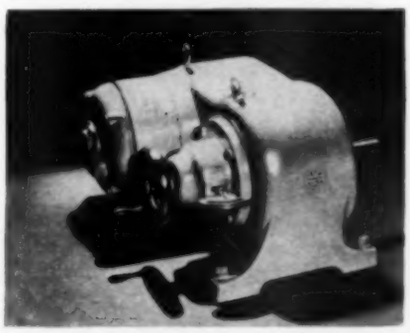
Eight-Speed, Selective-Type Gearbox applied to Landis Threading Machine to increase efficiency on materials varying widely in machineability

Speed changes are effected through self-locking levers conveniently located and easily operated. The unit is self-contained and is readily applicable to new machines or to machines now in service.

U. S. Varidrive Motor

Speeds over a wide range can be obtained at the will of the operator in the "Varidrive" motor, according to the U. S. Electrical Manufacturing Co., Los Angeles, Calif. Variable speed combinations from 25 to 10,000 r.p.m. can be controlled in steps as fine as 1 r.p.m. The Varidrive embodies an electro-mechanical power conversion which changes the fixed constant speed of the electrical unit to the variable speed necessary to drive machinery. Speed of the rotor is constant: speed of the take-off shaft is any r.p.m. the operator desires. At the turn of a wheel or the press of a button, variation of one, ten or 100 r.p.m. are available.

The drive consists of a squirrel-cage motor and a variable-speed differential which comprises dual disks coupled with a "Varibelt." The differential disks reciprocally expand and contract for higher or lower speeds, transmitting power through the Varibelt to the take-off shaft. The "Microspeed" indicator mounted on the case furnishes visual observation of the r.p.m. on the take-off shaft. The scale of the dial segment is removable so that special scales calibrated to the rate of production may be substituted. The Varidrive is quiet in operation, provides shockless transmission and is smooth in rotation.



Speed control as close as one r.p.m. can be secured with the U. S. "Varidrive" Motor

Morrison Speed Reducers with Adjustable Output Shaft

The Morrison Machine Co., 1171 Madison Ave., Paterson, N. J., is now building its horizontal speed reducer with the output shaft adjustable for distance above the floor. Loosening the clamp screw permits free rotation of the

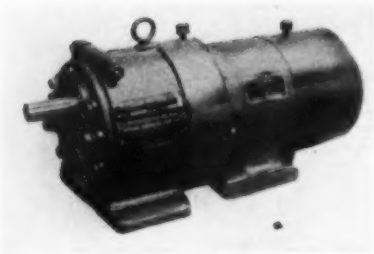


Fig. 1—Morrison Speed Reducer with horizontal adjustable output shaft. The ratio of model shown is 80.6 to 1

Fig. 2—Morrison Speed Reducer with right angle shaft. The ratio is 27 to 1

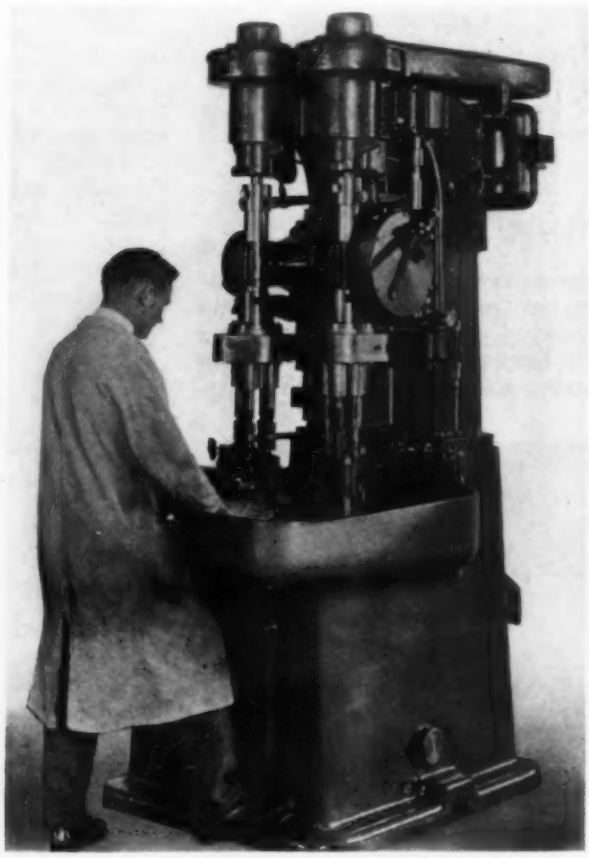
interior portion, and allows the spindle to be turned around the axis of the reducer, and, hence, assume any distance from the floor.

The company is also producing a right-angle model, in which the right angle unit may be changed in its relation to the main reducer, giving an upward vertical position of the output shaft, a horizontal position in either direction, or a position of 45 deg. to horizontal in any direction either above or below the horizontal. A glass window indicates the condition of the oil content of either model, and construction is such that oil cannot leak out.

Allen No. 3 Drilling Machine

A No. 3 drilling machine suitable for drilling and reaming, drilling and countersinking, or drilling and tapping has been placed on the market by the Chas. G. Allen Co., Barre, Mass. Each drillhead is controlled by its own cam which can be designed to produce any practical combination of quick advance, feed and dwell or any desired lead for tapping, independent of the drilling feed. The camshaft stops automatically at the end of each cycle. The locking pin in the circular table is withdrawn by the treadle and the camshaft starts instantly when the locking pin snaps into place at the completion of the index. This permits the operator to concentrate on loading and indexing without danger of being caught by premature engagement of the feed.

Loading four pieces at a time, 1,200 pieces per hour can be drilled and tapped in mild steel ½ in. thick with ⅞ in.-20 tap.



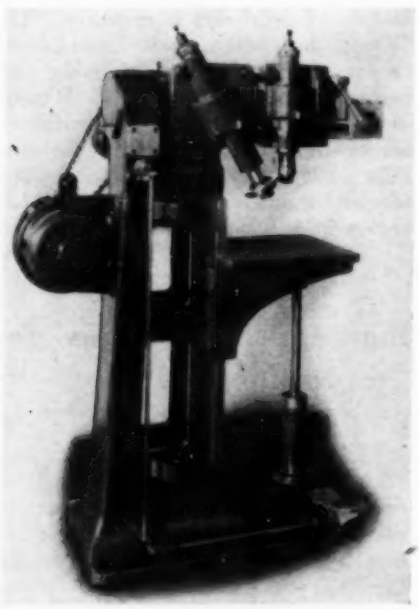
Allen No. 3 Two-Spindle Drilling Machine with V-belt vertical motor drive. Column and base with adjustable table can be furnished in place of cabinet base

McKinney Beading and Trimming Machine

Medium and large-size drawn shells can be trimmed on the beading and trimming machine developed by the McKinney Tool & Mfg. Co., 1588 Arabella Road, Cleveland, Ohio. The drawn shapes do not necessarily have to be round, but the inside corner radii must not be smaller than the small trimming roll. Because of the vertical design easier loading and unloading are obtained and parts of irregular shape can be handled without special holding devices.

Operation of the machine is as follows: The handle at the extreme upper right of the machine operates the saddle carrying the front vertical roll. When this lever is pulled forward the rolls are separated. The shell or part to be trimmed or beaded is then set on the table which has been previously set to the proper height. The lever is then pushed back bringing the rolls together. The cut starts immediately and the work revolves on the table until the cut is completed. It is a simple matter to change from trimming to beading by simply changing rolls.

Rolls can be run at a speed of 40 to 60 r.p.m. for beading stock up to 18



Drawn shells are quickly trimmed or beaded on this McKinney upright machine

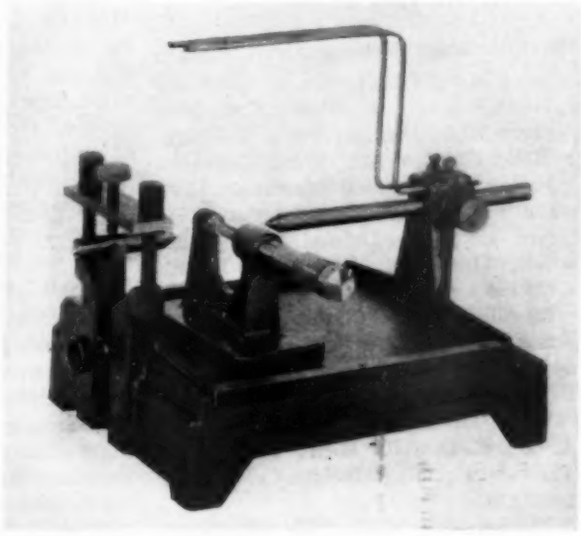
gage or for trimming stock up to 16 gage. Drive is from a motor mounted on the machine and is through V belts or silent chain.

Brown & Sharpe No. 200 Three-Wire Thread Measuring Fixture

A fixture for measuring screws and externally threaded parts where commercial tolerances may be allowed has been developed by the Brown & Sharpe Mfg. Co., Providence, R. I. The No. 200 fixture is useful for checking both short and long taps with even numbers of flutes. It also provides a means for checking external thread gages where the highest degree of accuracy is not demanded. Range of measurement is from 0 to 2 in. The fixture is furnished with two micrometers, one reading from 0 to 1 in.; the other from 1 to 2 in. A standard for setting the latter micrometer is included.

Threaded parts are held between the pointed shaft and the V-slide, the latter being adjustable to accommodate parts of varying diameters from $\frac{7}{8}$ to $1\frac{3}{4}$ in. An auxiliary short shaft can be used in the V-support, this shaft being provided with a point on one end and a bell-mouth on the other. The bell-mouth is useful when measuring very short taps and taps with pointed ends.

A feature of this fixture is the floating of the micrometers on steel balls, thus permitting the anvil to be "squared" with the measuring wires. Micrometers are graduated to read to one-half thousandths. Calibrated wires can be furnished in the "best wire sizes" for the required pitches. The wires are suspended from the adjustable support. The weight of the fixture is 11 lb.



Threaded parts can be checked to commercial tolerances on the Brown & Sharpe No. 200 Three-Wire Thread Measuring Fixture

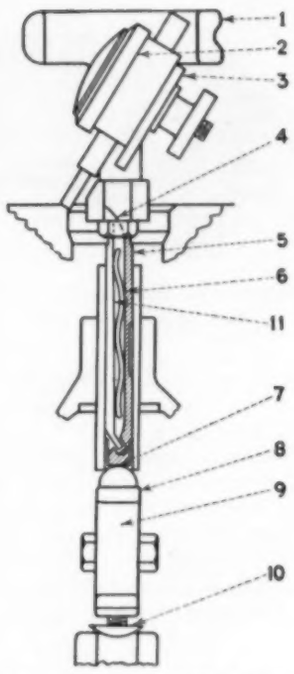
Opto-Matic Oiler

An automatic, visible lubricating system for ring or ball-bearing shafts, known as the "Opto-Matic" Oiler, has been placed on the market by the Trico Fuse Mfg. Co., Milwaukee, Wis. The oiler is designed to automatically provide a continuous oil feed. The micrometer adjustment permits a wide range of oil levels which can be secured by turning the glass oil reservoir. Filling the reservoir annually or semi-annually is all that is necessary.

P.M.S. Valve Seating "Concentrometer"

The P. M. Schlauch Tool Engineering Co., 4040 W. Philadelphia Ave., Detroit, Mich., has developed a tool which shows whether the angular seat of a gas-engine valve is concentric with the axis of the valve guide. The tool is adaptable to both intake and exhaust valve seats. Referring to the accompanying illustration, the various parts of the tool are as follows:

1. Indicator housing.
2. Precision indicator having a special attachment.
3. Indicator swivel supporting the indicator which can be adjusted to any desired angle.
4. Indicator pilot joint which makes a one-piece construction between the pilot No. 5 and the indicator housing.
5. Indicator pilot which is the three-point bearing member of the instrument. It is round and has a recess in the center. One side is flatted longitudinally, and the other slotted to carry a spring. The two edges of the flatted side form two of the three bearings while the spring forms the other.



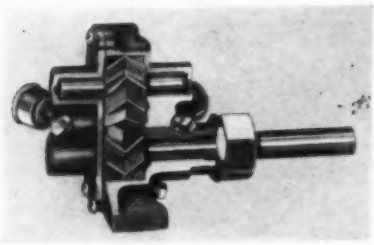
Side elevation of P.M.S. Valve Seating Concentrometer for determining whether a valve seat is concentric with the axis of the valve guide

6. Indicator pilot spring which maintains an outward pressure on the indicator pilot shoe No. 7. These two parts form the adjustable third bearing point of the pilot.
8. Indicator depth control pliers which are held rigidly open by the indicator pilot expansion spring No. 9.

To operate the valve seating concentrometer, first the depth control pliers are placed in position so that the centering and depth control adjusting screw is located in the valve tappet guide hole and the hardened ball in the lower end of the valve guide. Next, the indicator pilot is slowly pushed into the valve guide until its base rests on the steel ball of the depth control pliers. Then the indicator needle at the indicator swivel is adjusted until it rests easily on the plane of the valve seat. The indicator assembly is revolved around the valve seat and the indicator needle observed. If the needle moves from its zero position, the seat is not concentric with the axis of the valve guide and must be ground accordingly.

Oberdorfer Spur and Herringbone Gear Pumps

Rotary, bronze gear pumps are made in standard sizes from $\frac{1}{8}$ in. to $1\frac{1}{2}$ in. intake and outlet, standard pipe connections, by the M. L. Oberdorfer Brass

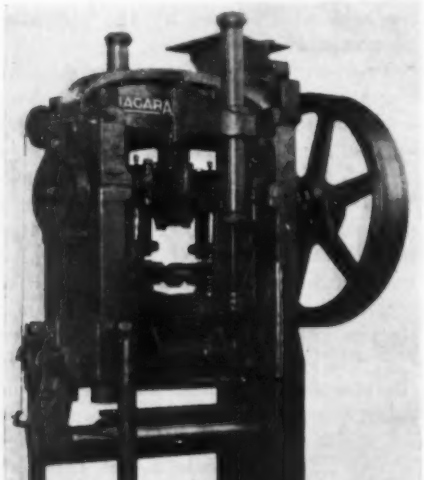


Oberdorfer Herringbone Gear Pump that operates quietly

Co., Syracuse, N. Y. These pumps are made in both spur and herringbone gear types. They have double bearings, are fully lubricated and are positive in action. Herringbone gear pumps effect a 25 per cent saving in power consumption over the spur gear type and are quieter. Pumps can be operated in either vertical or horizontal position, and spur gear pumps in either direction.

Niagara Double-Crank Horning Press

The Niagara Machine & Tool Works, Buffalo, N. Y., has recently added to its line a double-crank horn press for side seaming metal drums. The machine illustrated is equipped with a duplex side seaming horn for making hooks and closing the side seam of drum bodies. The adjacent edges of body cylinders are folded, one up and one down, in the first stroke of the press slide. In a second stroke, the previously assembled hooked edges, are bumped together. The closing or bumping tool is made with provisions for offsetting the seam either inside or outside.



Production of drum bodies of uniform diameter at both ends and with side seams tightly closed can be undertaken on this Niagara Horning Press

Similar equipment with a suitable horn produces the Gordon or compound side seam. The two channel-shaped edges are formed in the first stroke, followed by a subsequent stroke which bumps or closes the assembled edges to complete the seam. Attention has been given the design and construction to produce a practical machine for the drum shop from the standpoint of safety for the operator, flexibility to handle a variety of sizes and efficiency of performance.

The horn, a steel forging, is supported at both ends and permits side seaming relatively small diameters. Its convenient height gives the operator unobstructed visibility of the working tools.

The swinging latch which supports one end of the horn must be in the closed position before the press can be tripped. Interlocking treadle and single stroke attachment are available for clutch control. These safety features prevent the working stroke of the slide until the drum body is in correct position.

The press frame has four steel tie-rods shrunk in place. The two steel rods below at the left act as part of the housing and are spaced to provide clearance for the removal of the finished shell. Enclosed springs counterbalance the slide to minimize the duty on the clutch and brake.

• PATENTS •

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Metal-Working Machinery

Sheet Metal Drawing Press. Fredrich J Rode, Chicago, Ill. Patent 1,899,110.

Sheet Metal Drawing Press. Fredrich J. Rode, Chicago, Ill. Patent 1,899,111.

Boring and Turning Machine. Hermann Vogler, Dusseldorf, Germany, assigned to Schiess-Defries Aktiengesellschaft, Dusseldorf, Germany. Patent 1,899,124.

Machine Tool (Surface Grinder). Frank E. Stratton, Edgewood, R. I., assigned to Diamond Machine Co. Patent 1,899,362.

Worm Grinding Machine. Frederick A. Ward, Detroit, Mich., assigned to The Gear Grinding Machine Co. Patent 1,899,654.

Machine for Milling Threads. Peter P-G. Hall, Philadelphia, Pa. Patent 1,899,865.

Tools and Attachments

Tool Holder. Ferris T. Harrington, Detroit, Mich., assigned to Whitman & Barnes, Inc. Patent 1,899,326.

• TRADE PUBLICATIONS •

DRILL BUSHINGS. The Centerlock Drill Bushing Co., 12125 Cardoni Ave., Detroit, Mich., is distributing a circular showing its "Centerlock" drill bushings, locating pins, rest buttons and special precision bushings. Sizes are tabulated.

BEARINGS. Fafnir Bearing Co., New Britain, Conn., has issued a circular on felt-seal ball bearings showing single and double types, describing them, listing the advantages, and showing several typical applications. Basic dimensions and mounting dimensions are included.

FURNACES. H. O. Swoboda, Inc., 3530 Forbes St., Oakland Station, Pittsburgh, Pa., has issued a publication showing "Falcon" continuous electric furnaces for hardening, tempering and annealing strip metal and wire products. Several different types of construction are shown.

HONING. Bulletin No. 121, issued by the Barnes Drill Co., 814 Chestnut St., Rockford, Ill., gives new illustrations and revised data on the honing process and its complete line of honing machines. Special emphasis is placed on connecting-rod honing and on mirror-smooth cylinder finishing. Horizontal types of honing machines are also shown.

SPEED REDUCERS. Publication L-20562, issued by the Westinghouse Electric & Mfg. Co., Nuttall Works, Pittsburgh, Pa., describes the complete line of Westinghouse "Gearmotors". Illustrations include several applications together with detailed views of each model. Tables of output speeds are included. Also a revised publication has been issued, "Westinghouse Multi-Speed Gearmotors", in which has been included tables for horsepower ratings and speed tables for motors from ½ to 15 hp. Four speed changes are provided.

WELDING EQUIPMENT. Smith Welding Equipment Eastern Corp., Roslyn, (Philadelphia District), Pa., has issued a new circular for 1933 covering its welding and cutting equipment, showing a complete line of torches, tips and various welding accessories besides acetylene generators and gas regulators.